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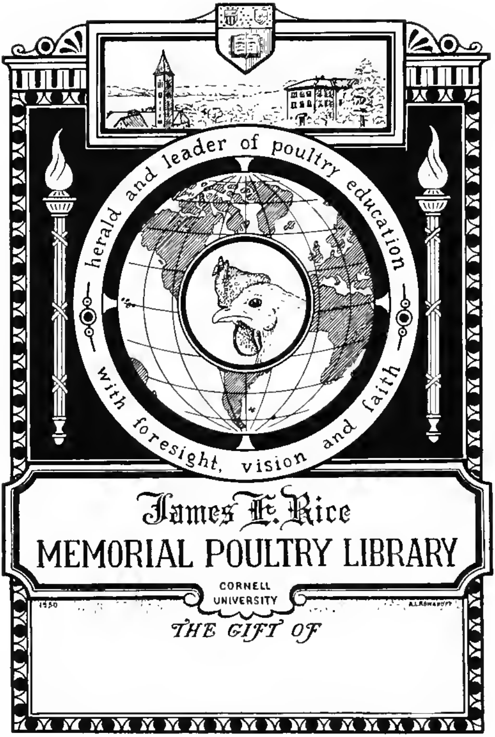
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THE
POULTRY DOCTOR

Being a Description of the
DISEASES OF POULTRY
With Directions for their Treatment
Surgically and Medicinally

By
"MID-ENGLAND"

(REVISED 3rd EDITION)

LONDON
THE POULTRY PRESS, LTD.

(*The Offices of the "Poultry World"*)
LINK HOUSE, 54-55 FETTER LANE, E.C.4.

From The Library of
Dr. Olney Brown Kent

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FOREWORD
TO
REVISED EDITION

The Author, in presenting the present up-to-date Edition of *The Poultry Doctor*, takes occasion to express his gratification at the remarkable reception which has been given to the book since it first reached the hands of the public. This reception has abundantly proved the necessity for an accurate and clear, but not too scientific, book on Poultry Diseases.

The present Edition contains various new suggestions and may be regarded as fully up to line with recent experience in poultry-culture.

"MID-ENGLAND."

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The Poultry Doctor

CHAPTER I.—INTRODUCTORY

General Suggestions—Causes of Disease—How to Make a Post-mortem Examination.

GENERAL SUGGESTIONS

It would be difficult to say how many books have already been printed, or how many learned articles and treatises have been written and published, upon the subject of diseases of poultry. There has been no lack of information; that is perfectly clear to anyone who is interested in the subject. Two great faults can be found in much of what has been and is being written upon the subject of poultry-doctoring, although these faults are not always apparent; for it is satisfactory to feel that, after many years of contemptuous neglect, attention is being given to the subject of poultry diseases by men scientifically qualified to deal with it. The two faults referred to are: (1) The information is too learned and abstruse and theoretical in some cases; (2) the opposite in the other—the information bears on its surface the stamp of ignorance. We want to try and avoid both these faults, if possible, in the work now published. It may, however, be premised that there is nothing very new to be said at present about poultry diseases. Until the bacteriologist has investigated the subject more fully, and has descended from the atmosphere of science to the region of simple practicability, and has shown the poultry world clearly what it really is waiting to know about that department of science, there will be nothing very original to be said. It will, however, be something to the point if we set out here with the intention of classifying the ailments of poultry according to present knowledge, describing the symptoms of each, and suggesting the simplest and most effective methods of dealing with them, as far as they can be set out in the light of present-day knowledge.

In the first place, let us investigate general

CAUSES OF DISEASE,

with a view to ascertaining how far it is possible to prevent, or at least to minimise, loss in the poultry-yard. Losses there are which are quite unavoidable, for poultry cannot be expected to be free from complaints any more than human beings can. That the amount of disease prevailing amongst poultry is very far in excess of what it ought to be, and that a great deal of this disease is due to sheer ignorance and neglect, are commonplaces that scarcely need repetition. Yet it is so. Put into a brief, practical form, we may say that the chief causes of disease are overcrowding, want of proper ventilation in the roosting-places, uncleanliness and filth and general insanitary conditions, and wrong systems of feeding. Almost every disease can be traced to one or other of these ordinary causes. It is perfectly true that some diseases are hereditary in their origin, or, if not exactly hereditary, that there is a predisposition to them, which favourable circumstances will convert into actuality. It is also true that many diseases are contagious or epidemic. Contagious means spreading by contact, whilst epidemic means spreading, not necessarily by contact, but by the agency of germs circulating in the atmosphere. These are rough-and-ready and not altogether scientific explanations, but that is, broadly, the difference between contagious and epidemic. An epidemic or contagious disease must, however, spring from some insanitary or similar cause. We need not, however, dwell over this. These are the principal causes, and poultry-keepers will do well to make it their business to avoid them as far as possible. Personal attention to poultry means a very great deal, and saves a lot of anxiety, trouble, and loss. It is quite useless to leave to other people the duty of attending to these matters. The successful man in poultry-keeping, therefore, will be the man who is constantly on the spot, looking after things himself. He need not make a labour of it. Let him supervise, and see that other people do their duty; then he will know that everything is right. We now pass on to the subject of

MAKING A POST-MORTEM EXAMINATION.

When an epidemic of disease breaks out in a poultry-yard it is always advantageous to examine one or more dead birds to note the internal symptoms, and to ascertain precisely what the disease is, with a view to taking the proper measures to get rid of it. Plenty of people wait until they have lost two or three hundred birds before they take the trouble either to make a post-mortem themselves or to employ one of the well-known specialists to do it for them. Any practical poultry-keeper can make a post-mortem to a sufficient extent to determine what is wrong in most ordinary cases. A short description of the way to set about it will, therefore, be useful here. The implements necessary are a pair of forceps, a good, stout pair of scissors and another pair of curved, finely-pointed surgical scissors, a blow-pipe, one or two scalpel-knives, a sponge, and some carbolic or other antiseptic. The bird to be examined should be placed with its breast upwards on a strong piece of board, laid flat upon a table. First of all, let the wings and legs be stretched out, and be fastened down on to the board by means of a small nail, hammered through the joints of each wing and through each foot. The bird need not be entirely plucked; it will be sufficient to pluck the feathers from the breast and then pinch up the skin and cut it right through from the tail along to the crop. The skin can then be drawn back on both sides, and the flesh will be fully exposed. This can then be cut through with the scalpel-knife, and, by the aid of the strong pair of scissors, the centre of the breast-bone can be cut entirely out. It is, of course, essential that the latter piece of work should be done carefully, so as not to injure the organs in any way, particularly the heart. Any careless manipulation will probably have the effect of causing a post-mortem bleeding, which will interfere materially with subsequent investigations. The principal organs will now be exposed to view, and can be examined in order.

The liver will be the first thing that is noticed, and the proper colour of this is a rich chocolate-brown. If there are any specks, if it is of light colour and soft and pasty, it is bad. Most people know what a healthy liver looks like ; it requires little or no explanation. Now look at the heart. This should be firm to the touch, and even-lobed—that is to say, both sides of it must be equal, or nearly so, in size. Sometimes a heart is found to be quite empty on one side and fully distended on the other ; this is one of the symptoms of heart failure, and may account for death, if it is reported that the bird died suddenly. Sometimes the heart presents a spotted appearance, in sympathy with the lungs (which can next be examined). The lungs lie on either side of the heart, underneath, and they are spongy, pink bodies. If in a perfectly healthy state, a piece cut off from either of these will be found to float in water. The lungs of poultry are frequently tuberculous—that is to say, they are full of little nodules—tubercles. The expression "tubercle" means a little tuber, and is quite a characteristic name for the complaint to which it refers. The lungs are the most usual seat of tuberculosis, and there is no mistaking these cheesy-looking tubercles or nodules.

If up to this point there is no very clear indication as to the cause of death, investigation must be continued into the crop, and the gullet and windpipe can be cut through from end to end. Very often chickens will be found suffering from some diptheritic symptom, and it may be there will be worms in the trachea. With adult fowls it is very often necessary to make an examination of the skull, to see whether apoplexy has been the cause of death.

The amateur must bear in mind that, in making a post-mortem, he will probably have some information available at the outset. If, for example, death was preceded by giddiness, twisting of the neck, and such symptoms, lasting for several hours, it will be quite safe to assume that apoplexy was a possible cause. If death, however, were sudden, it would certainly not be apoplexy; it would most probably be heart trouble (syncope—failure of the heart's action). So that the examination of these different parts can be varied or modified according to circumstances. One does not begin groping in the dark, although sometimes it is necessary to do so—that is, when no information whatever is available. If it be considered advisable to examine the state of the brain, begin at one corner of the mouth, and strike a line for the opposite corner, round the back of the head. Do this with the fine scissors, and then it will be easy to lift up the skull from the back, and the brain substance will be revealed. If there be any effusion of blood on to the brain out of one or more of the little vessels which will be seen traversing that organ, this is conclusive evidence of apoplexy in conjunction with other symptons, the existence of which previous to death may have been known.

In other cases, it may be necessary to examine the intestines or the egg-organs, if the subject be a hen. There is really no difficulty about this. The only thing is to be able to distinguish between discoloration after death and discoloration due to the disease which was present before death. However, a little practice will soon enable anyone to form a good general opinion in this direction; and enough has been said to enable the reader to detect at least the commonest causes of death, and any practical hand will very quickly be able to deal with a subject like this without any special difficulty. It is important when cutting a body open to avoid the big blood vessels, as effusion of uncongealed blood often gives extra trouble. Sometimes all the blood in the body will be found in a solid mass—a blood vessel having burst (as, for instance, may happen from extra exertion in laying).

Missing Page

deal effectively with our subject, and, first, it will be useful to refer very briefly to

THE ANATOMY OF A FOWL.

We have already considered how to make a post-mortem examination. That has sufficed, I hope, to give the reader a good general idea of the internal organs of a fowl and of the symptoms which indicate specific diseases. It would be an incomplete description, however, were all reference to the framework omitted. The first thing to strike an observant eye regarding the skeleton of a fowl would probably be the lightness of the bones. This is what we find in all birds. Birds were intended by Nature to fly, and so Nature has provided them with a framework which will retard as little as possible their easy and rapid progress through the air.

All bones, whether of animals or of birds, contain air-spaces, the object of which is naturally to circulate oxygen to keep the bones healthy. Now, the bones of a fowl or of any bird contain more of these air-spaces than do those of animals, and not only does this fact explain why birds can fly easily, but it explains another curious fact, and that is, that broken bones heal more quickly in a bird than in an animal. There is a more extensive circulation of air through these air-cavities and so the bones are encouraged to heal up at once. This shows the importance of dealing very promptly with anything in the nature of a fractured leg or wing ; if it is not set properly at once, it will set itself, most likely in a mis-shapen form.

The skeleton of a fowl is remarkably like the skeleton of a man. The principal feature missing from the former is the double row of teeth, but there are the two mandibles of the beak by way of compensation. Practically there are the same parts to the skeleton of a fowl as to those of men and animals, but they are modified to the particular uses of a bird. The wings, for example, correspond to the arms of a man or the forelegs of an animal ; the toes are capable of contraction for purposes of flight. There is no necessity to enter here into a fuller description of these resemblances.

ORGANS OF RESPIRATION AND CIRCULATION.

The respiratory, or breathing organs include the nostrils, windpipe, and lungs; the organs of circulation are the lungs, heart, and blood-vessels (the last-mentioned term including arteries, veins, and capillaries). The blood of a fowl is about 8 per cent, of the actual weight of the bird. It has a double function. It carries food to different parts of the body from the digestive organs, and it carries oxygen to unite with and complete that food, as it were, from the organs of respiration. The carbon of the food, finding its way into the blood through the liver and other organs, meets in the blood the oxygen inhaled through the lungs, and the two combine to form carbon di-oxide, or carbonic acid gas, which is exhaled through the lungs. In the process of uniting, the two have generated heat. That is how bodies are kept warm; there is chemical action going on constantly.

The temperature of a fowl's body is considerably higher than that of the human body. The normal temperature of the latter is 98.4 deg. Fahrenheit; that of the fowl is 104 deg. Fahrenheit. Obviously, therefore, that is the degree needed for successful incubation. If eggs could be kept exactly at 104 throughout the period of incubation, probably the result would be more satisfactory than it frequently is. The heart is, of course, a sort of pump. As it contracts, it forces out its blood into the main arteries, which in turn fill up the veins, and the veins supply the capillaries. In its course the blood passes through the lungs, where it takes up its oxygen.

The organs of respiration, taken in order, are (1) the nostrils, through which the air first enters, and where any solid particles are stopped and prevented from passing on to the lungs; (2) the trachea, or windpipe, which may be seen to originate in the "glottis" or slit at the back of the mouth; and (3) the lungs. The trachea traverses the neck, and when it reaches the body it divides into two channels, termed "bronchi" or "bronchial tubes," which enter the lungs—one into each of the lobes—right and left. The lungs themselves are situated close up to the ribs, as it were, between the shoulders, and they are covered with a membrane called the "Pleura." (Pleurisy is an affection of this membrane.)

HOW RESPIRATION IS CARRIED ON.

There are a number of small air-sacs communicating with the bronchial tubes and also communicating with the bones. They lie, as it were, between the flesh and the bones, and as the muscles of the ribs relax and the trunk expands, these air-sacs dilate themselves with air; when the rib-muscles contract the air-sacs are compressed, and the air, which has circulated itself through the body, is forced out. This is the explanation of inspiration and respiration—of breathing in and breathing out. It will be obvious that, whatever there be of impurity in the air inhaled by a fowl, that impurity will at once be circulated into all parts of the body; poultry cannot be thoroughly healthy unless the air they breathe is quite pure and free from such impurities as carbon di-oxide—the burnt-up product of former respiration. Every fowl ought to have at least fifteen or twenty cubic feet of air-space allotted to it in a roost. All this tends to emphasise the importance of paying special attention to the

VENTILATION OF POULTRY-HOUSES.

In spite of the conservatism and prejudice of past years common sense is at length beginning to prevail in regard to the housing of poultry. I find in all directions now open-fronted houses—houses, that is, which have one side or the front consisting, not of boards, but of bars or stout wire-netting. When poultry are roosted in such houses as these, they are practically sleeping in the open air, without suffering from wet or cold, as they would be in the trees. They are breathing fresh, pure air all the time; consequently, they never get these catarrhal symptons (unless it be by means of contagion), and so rarely suffer from roup and kindred ailments, which, as I shall presently show, are brought about by this very catarrhal trouble that we have been dealing with. The open-fronted method is the ideal and most perfect system of ventilation; next to that is the "end to end" system, which means a clear current of air along through the apex of the poultry-house, above the heads of the poultry, which should be roosting on perches all on the same level, midway between the floor and the roof. By having ventilation-holes at both ends a current of air is passing continuously through, carrying the foul air away in its course.

RESPIRATION AND DIGESTION.

With regard to the diseases which affect the organs of respiration it is important to bear in mind that the breathing organs and their healthy condition are intimately concerned with the digestive organs and *their* healthy condition. I have said that the breathing organs consist of the nostrils, the trachea (or windpipe), and the lungs. We may add to these, for present purposes, the heart, because the action of the heart depends upon, and also influences, the action of the lungs. The digestive organs are also very intimately connected with the lungs, because, as will readily be seen, one could not nourish the fowl without the other. The breathing organs are as much organs of food as are the crop and other organs of digestion, because it is through the breathing organs that the oxygen and nitrogen of the air are carried into the blood, where the oxygen meets and combines with the carbon in the food, which has reached the blood *via* the liver and proventricle. It, therefore, is absolutely essential that both the breathing and the digestive organs should act in unison, so that the body can be supplied with its proper nourishment, and so that the warmth generated by the combination of the oxygen and the carbon in the blood may be sustained. Obviously, if either the lungs or the liver be out of order, the whole machinery will get wrong, and it is only by every organ working in due order and with proper regularity that poultry can be kept in profitable condition.

CHAPTER III.—DISEASES OF THE RESPIRATORY ORGANS.

Commonest Cause of Lung Trouble—Catarrh or Nasal Cold—Roup ("Wet" and "Dry")—Swelled Head—"One-eye" Cold—Diphtheritic Roup—Bronchitis—Need for Moist Warmth—Asthma—Pneumonia—As it Affects Chickens—Symptoms of Pneumonia—Its Cure.

COMMONEST CAUSE OF LUNG TROUBLE.

A fowl in perfect health breathes through its nostrils. The air passes down the trachea into the bronchial tubes, and so into the lungs. Suppose the bird to be suffering from a cold or mild attack of roup. The nostrils will be stopped up, so that the aircannot pass through them, and, as the lungs must have the air they require, it can only enter through the mouth. What is the consequence? The mouth was not intended to act as an organ of respiration, but as an organ of feeding. The narrow passages which we call the nostrils were provided in order to catch the minute particles of solid matter with which the atmosphere is laden, so as to prevent them from reaching the lungs; but these now pass through the mouth into the windpipe, unhindered and unchecked. We have here a simple explanation of the reason why medical men advise patients to cultivate the habit of breathing through the nostils instead of through the mouth. The habit of breathing through the mouth is conducive to lung disease, especially amongst persons employed in factories where there is a great deal of dust.

When solid matter finds its way, unhindered, into the windpipe, irritation may be set up there, which will possibly reach the lungs; in fact, it may be that some of these very particles themselves may penetrate beyond the windpipe into the bronchi, and thus actually reach the immediate region of the lung-substance, and set up blood-poisoning, perhaps, there.

Most trouble of the organs of respiration starts in the nostrils. A simple " cold in the head," as it is called, may be communicated to the other passages very rapidly. Colds often start in this way: A bird is roosting in a close atmosphere, laden with carbonic acid gas (exhaled from the lungs of other poultry roosting in the same apartment), and this carbonic acid gas is of an irritating nature; consequently, it sets up irritation of the nasal membranes. These membranes exude a sort of pus or phlegm, just like what is developed by irritating matter in the intestines (giving rise, in their case, to diarrhoea). Here is the history of a cold. Let it be recognised that it is not lowness of temperature, but impure air, that gives colds in the heads to birds or to human beings. Of course, there is contagion to be considered.

CATARRH, OR NASAL COLD.

A creature suffering from cold or catarrh invariably sends forth into the atmosphere large numbers of germs or bacilli, which settle in the nostrils of other creatures, and where the conditions are favourable to their development, start microbe colonies there. I should add that a chill will often precipitate the development of a cold, because, when the nostrils have been reduced to a state of irritation by the impure atmosphere inhaled by the bird during the night, it will be more susceptible to a chill than it otherwise would have been, and when let out into the cold, fresh morning air, a thorough-going cold in the head or attack of catarrh will be developed at once.

ROUP: ITS CAUSES AND ITS CURE.

Roup is a peculiar disease, and responsible, probably, for more trouble than all other complaints put together (if we except liver disease, to which, by the way roup is often allied). Roup, in the strict sense, is a disease of the nostrils—a sort of nasal catarrh—but it has grown to more serious proportions than that, and, as we shall presently see, it is now a blood disease in most cases—or, at least, it involves a combination of ailments that can only be classified together as such. The word

" roup " itself is derived from a Saxon word, indicative of the croaking sound produced by birds suffering from the complaint. This whoop or croupy noise is caused by the air not getting free action in the breathing-tubes, which are stopped up with phlegm or catarrh.

We will deal first of all with the ordinary forms of roup. There is generally a beginning in the shape of an attack of ordinary sneezing cold in the nostrils, due, perhaps to a sudden change of weather, or to local irritation when a fowl has been roosting in a closely-boxed-up house with a number of others, all breathing each others exhalations over and over again. This causes an irritated condition of the nasal membrane, and when such a thing occurs (this is characteristic of any other membrane than that of the nose—of the intestines, for example), a catarrhal discharge is occasioned. Now, suppose the nasal membrane to be irritated in this way at a time when the bird is in a more or less unhealthy condition, as, for instance, when its liver is not acting properly, and there is an accumulation of foetid matter, consequently, in the blood—then an attack of roup may be looked for, because the tendency will be for the impurities in the system to make their way to the irritated surface, there to be discharged. Or should the bird have some hereditary tendency to tuberculosis, this will make its presence felt on the first encouraging opportunity. The same may be said of half-a-dozen other matters, but enough has been said to emphasise the importance of guarding against, and of promptly dealing with, even simple colds.

The ventilation of poultry-houses is the best preventive measure. As was said in a previous chapter, the carbonic acid gas exhaled by birds is poisonous, and likely at once to set up local nasal irritation, so that it becomes very desirable that what has been exhaled by one bird should not be inhaled by another ; and that is why those who understand the subject most fully always recommend the open-fronted system in poultry-roosts, so that there cannot possibly be any accumulation of bad air. Nothing is more likely to make poultry diseased and unprofitable than for them to be crowded together in close, ill-ventilated roosting-places. Now to distinguish between

WET AND DRY ROUP.

Wet roup is the name given to that phase of the complaint in which there is a copious discharge, first of all of almost clear fluid, and afterwards of an unwholesome mucus, getting thicker and more offensive. Dry roup is a condition in which there is comparatively little discharge; but there is the same irritated condition of the breathing-tubes as in the other form of the complaint. As a rule, the wet form can be cured most readily; but it is very desirable not to check it too quickly, less the complaint be thrown back, as it were, into the system. One of the remedies recommended by experts has been balsam of copaiba, obtainable in the form of capsules. This is, no doubt, an excellent remedy, but it often acts so suddenly as to cause the risk to which I have alluded. It is a better plan to encourage the discharge for a few days, as, by doing this, it is more likely that the system can be thoroughly cleared of any impurities it may contain. The copaiba cure, therefore, should only be resorted to as a final corrective.

Begin treatment by giving all the poultry—whether affected or not—some roup powder in their soft food, just by way of a preventive; let the birds attacked have regular doses of roup pills, and bathe their nostrils with warm water containing a little permanganate of potassium or a few drops of coal-tar solution. Borax also is a most excellent antiseptic, and requires warm water to effect its solution. Boracic acid is equally efficacious, and has the advantage of being sufficiently soluble in cold water.

SWELLED HEAD.

Very often the faces are swollen, and matter oozes from the eyes; this necessitates bathing the faces from time to time with warm water and antiseptic. This leads me to mention the fact that "swelled head" is the usual form roup takes in turkeys—particularly young turkeys. These birds contract cold, and their faces puff up on both sides, completely closing the eyes so that they are unable to pick up their food. Consequently, they have to be fed by hand, and, unless this is done, will lose flesh very rapidly, even if they do not succumb entirely. The complaint, unfortunately, comes on just at the time when these young birds are ready to be fattened off for market, and turkey-raisers know to their cost how serious a matter it is for swelled head to make its appearance in the autumn. It is a good plan to foment the heads of the turkeys with hot decoction of poppy-heads, as there seems to be a considerable amount of pain caused by these swellings, which the opium in the poppy-head relieves. The cause of the inflation is obvious. The nostrils being stopped up by mucus, the air forces its way into other channels, and the tear-ducts become affected, so that they, too, are congested, and the cheeks are puffed out in consequence. Hot fomentations, apart from the soothing influence of the opiate, tend to loosen this state of congestion, and will restore the face to its natural condition with greater expedition than any other remedy. It is of great importance that care be taken to guard the bird from a fresh chill after fomenting.

"ONE-EYE" COLD.

This is a very peculiar form of roup. It is one of the worst and most treacherous of diseases. It breaks out in the most mysterious way, and spreads with alarming rapidity through a whole flock of poultry. The way in which it appears is very curious. A number of poultry will go to roost at night in apparently perfect health. Next morning, when they are let out, one of them seems to be blinking one eye, and, on closer examination, there appears to be a little froth in one corner of the eye. The poultry-keeper takes no particular notice of this, perhaps; but it rapidly develops, and in a few hours it is very much worse. Ultimately, unless prompt measures be taken, the eye becomes so diseased that the sight may be lost entirely when the discharge itself has been cleared away. No sooner has one bird started this complaint than others, in rapid succession, will develop it also, and the greatest difficulty will be experienced in preventing it from spreading to every bird in the yard.

The best plan to adopt is to immediately isolate any bird that shows symptoms of this complaint. There is no mistaking it; a little white froth in the corner of one eye is quite sufficient warning. Remove the victim, and, having bathed the eye with warm water containing a grain or two of permanganate of potassium, give a dose of roup pills, and await events. The frothiness will certainly begin again, and the same treatment can be repeated, and should be continued as often and as long as is necessary. Meantime, let all the others be dosed with preventive physic of some sort—roup powder in their soft food or a saline laxative in their drinking-water, whichever is the more convenient. I may say that the disease seems to be more virulent at one time than at another; probably this depends upon the general conditions under which the poultry are kept and the class of food they get.

DIPHTHERITIC ROUP.

This, I may say at the outset, is really a fungoid disease, and is not properly roup; but it is generally looked upon as of the roup class, because it is frequently accompanied by more or less catarrhal discharge. It is a horrible disease. The stench coming from birds suffering with the complaint is utterly indescribable; no odour could be more sickening. The disease itself takes the form of masses of cheesy substance growing on the membrane of the mouth and throat, sometimes also getting into the windpipe, in which event suffocation is almost certain to result. These cheesy masses—"canker," they are called when affecting pigeons—are often found to have eaten their way far down into the flesh, and will come away like the roots of a tree when fully ripened.

The "canker" stage is the last stage, really, of the disease. It is the time for killing or curing. The bird affected has been ill for some weeks; the poison has been in the system, picked up at some show or sale from another affected bird. When the germ-development has reached its last stage, the fungoid growths make their appearance, and the system is proceeding to unload its poison.

The treatment is quite simple, though the abominable smell exhaled renders the application of it far from enjoyable. A piece of wood should be sharpened down to a point, and with this the cheesy masses should be detached from their hold inside the mouth. They will come away, leaving behind more or less raw places. These places should at once be touched with solution of nitrate of silver ("caustic") by means of a camel's-hair pencil. The bird can then be left until the following day, when it will probably be found that some more growths have appeared. These should be dealt with similarly; and again, on the third day, another dressing will probably complete the cure, and the bird will be permanently free from the disease. There need be no deaths except such as are occasioned by suffocation, when the windpipe is affected—a comparatively rare occurrence. For medicine give the same remedies, and for prevention take the same measures of precaution as already described.

There is really no reason why a number of birds affected with diphtheritic roup should be killed and buried, as has been suggested by some writers. Indeed, it would be unwise to adopt this course, because that would simply mean that probably the majority of the birds in the yard would have to be destroyed if perfect immunity is to be ensured; and then, when all this destruction has been wrought, there would be no certainty whatever that new stock purchased would not at once contract the complaint, and so further disaster might result. In the writer's experience, it has proved most effective to set about curing the birds affected. These will then be inoculated against any recurrence; and it is quite as easy and effective to disinfect the place there and then as it would be if it were intended to introduce new stock altogether. All cages or baskets in which sick birds have been confined should be destroyed, also all material likely to retain the infection ; in fact, every possible precaution should be taken that will tend to prevent any fresh development of the disease. There is no reason why the treatment recommended should not prove effective—I was going to say, in ninety-nine per cent. of cases ; but that will perhaps, be an exaggeration. At all events, the only birds likely to die are those in whose cases the growth appears in the wind-pipe, where it cannot be reached, and suffocation ensues. Beyond these instances, the rest will assuredly recover, and be none the worse for their uncomfortable experiences. The discomfort truly, is not all on the side of the unfortunate birds ; the owner or his poultryman finds it very objectionable to have to treat a number of birds, on account of the disagreeable odour which accompanies the disease.

BRONCHITIS.

It is very desirable that birds should inhale through the nostrils, and not through the mouth the air passing down the trachea, then, behind the crop, finds a double passage—the trachea dividing into two bronchial tubes (as they are called), one leading to each of the two lungs. These bronchial tubes in turn are sub-divided into a number of lesser tubes, and so is completed the apparatus of the lungs. Now, when we speak of bronchitis, we are referring to the disease caused by congestion of these bronchial tubes. Like the nasal passages, they are liable to become congested with phlegm (which is really catarrh), and it is obvious that when that occurs, there is considerable risk of suffocation. Clearly, there is much more danger to a bird if its bronchial tubes are inflamed and congested than if its nostrils only are stopped up ; and, as nasal catarrh may be communicated to these passages lower down, and nearer to the lungs, it is evidently of great importance not to neglect even an ordinary cold in the head, but to get it cured as speedily as possible, lest worse effects ensue. Here, then, we see what bronchitis is, and how it originates. And now we will discuss the method of curing it and also its relation to asthma and to other allied complaints, which are responsible for a great deal of mortality amongst poultry.

Bronchitis is due to irritation in the passages leading to the lungs. That irritation can be intensified by certain atmospheric conditions. For instance, when the air is very dry—as it is in frosty weather—bronchial trouble will be intensified. The reason why old folk who suffer from bronchitis are worse in frosty weather than at any other time is that all the moisture has been taken out of the atmosphere to form hoar frost (which is merely solidified moisture), and the result is that the air is dry and consequently irritating to the breathing passages. Asthmatic folk are always better in wet weather, especially if it be mild as well, because there is plenty of moisture in the air. It is not the extreme cold or frosty weather that makes them worse, but the dryness of it. Now, what affects the bronchial tubes of a man equally affects those of a fowl. In other words, a fowl suffering from bronchitis can be relieved most speedily by the aid of moist warmth.

NEED FOR MOIST WARMTH.

It may be said with truth that no medicines are needed for the treatment of bronchitis. Put the affected creature into a room where there is a fire, and on the fire put a bronchitis-kettle, or, failing the genuine kettle, an ordinary kettle with a long spout, and let it "steam" the room well. Before starting the kettle to boil, add a teaspoonful of liquid terebene to the water it contains. This will act as an antiseptic, and will assist in giving speedy relief.

When the bird is in a bad way, and appears to have difficulty in swallowing, a few drops of oxymel of squills may be given occasionally as a soothing remedy, and, if feverish and thirsty, may be allowed to drink freely of barley-water or thin linseed-tea. Great care should be taken to guard against a relapse when the bird has been relieved of the bronchitis. On no account should it be set at liberty again as soon as it appears to have recovered. It must be gradually accustomed to normal outdoor conditions, and should never again be allowed to roost in any other than an open-fronted house. I have already written in strong terms about the need for having properly ventilated roosting-houses. There is only one way of securing full ventilation, and that is by having the air inside a roosting-house precisely the same as it is outside; and this can be secured only by adopting the open-fronted principle.

ASTHMA

Asthma can be described in a concise way as being recurrent, spasmodic, or chronic bronchitis. That is not a strictly accurate description of it from a scientific point of view, but it is near enough for our present purpose, and it means that repeated attacks of bronchitis lead up to asthma. True, some cases of asthma are directly and solely due to heart trouble; but the majority arise from weakness of the heart brought about by bronchial attacks. What happens is really this: the disorganisation of the lungs by bronchitis prevents the proper working of the heart, and, consequently, the latter organ is liable to be erratic from time to time, and to refuse to give the requisite supply of blood to the lungs. Consequently, asthma is the result of inefficient working or want of harmony, shall we say, between the lungs and the heart.

It is useless to pretend that asthma can be cured—it cannot. To cure it one would have to substitute new lungs or a new heart for the existing organs. But asthma can be relieved, and the more speedily relief is given, and the less prolonged and less frequent the spasmodic attacks are, the longer the afflicted creature is likely to live. Death usually occurs by the process known as "syncopal asphyxia," which, being interpreted, means suffocation resulting from failure of the heart to perform its functions, by reason of which the lungs cease to act. The only thing, then, that can be done for an asthmatical bird is to treat it as though one was treating an attack of bronchitis; but, beyond that, give stimulants. A few drops of brandy, whisky, sort wine, or other alcoholic stimulants should be given in order to urge the heart on to do its work. As I have already indicated, preventive measures are of most importance, backed by prompt treatment, when an attack does develop. Obviously, after reading all these particulars, it will appear that the trouble of doctoring an asthmatical bird is greater than the value of the bird, unless it be an exceptionally fine specimen, the life of which it is specially desired to preserve.

PNEUMONIA.

This is quite as fatal a complaint amongst poultry and other live stock as it is amongst human beings. It is generally termed "inflammation of the lungs"—a description to which we shall refer again presently. It does not of necessity arise from cold, although it most frequently does; but there are other causes leading up to it, if not actually bringing it about—such, for instance, as getting some food or other foreign substance down the windpipe instead of down the oesophagus into the crop, as should occur. This would not be removable unless coughed up before it had proceeded far, and if it got past that stage it would set up inflammation and blood-poisoning, especially if the bird was in a state of health not altogether of the soundest character. But so far as full-grown poultry are concerned, except in an occasional instance arising from a cause like that which has just been outlined, the cause of inflammation of the lungs may generally be discovered in a thorough wetting or chilling, such as a bird gets when it is left in a cold basket on some railway station platform.

It is a marvel that more valuable birds are not sacrificed than do actually succumb to the ineptitude and indifference of railway officials. One wonders sometimes why the Society for the Prevention of Cruelty to Animals does not look after the wretched poultry sent about from station to station in the bitterest of weather, without sufficiently strong canvas around the hampers or crates in which they are packed, often so cramped and crushed that there is absolutely no room for them to turn round. Certainly, many a valuable prize bird has been sacrificed by negligence in this way ; but, unfortunately, the owner has no means of proving it, or we should probably find some railway companies waking up to the necessity for being more particular in such matters.

Another way in which pneumonia gets started is by the bird getting its blood into an impure and unhealthy state, when it will naturally be very susceptible to a chill, such as might arise from wrong methods of housing. When will poultry-keepers learn that pure air is better than warm air ?—that the oxygen of the air is necessary to keep up the warmth of the body, and that when a bird is obliged to go on breathing carbonic acid and other gases, such as the atmosphere of a boxed-up poultry-house is laden with, the tendency is for the bodily warmth to be lessened, and for the blood to become unhealthy ?

THE COMPLAINT AS IT AFFECTS CHICKENS.

The modern artificial "brooder" is responsible for practically the whole of the lung complaints which carry off chickens in thousands. There is, of course, always a disposition on the part of the poultry-raisers to overcrowd their brooders with chickens ; naturally, perhaps, they are anxious to rear as many as possible, and the consequence is that they fail where they would have succeeded had they limited the scope of their efforts somewhat. Chickens can endure a considerable degree of cold without ill-effect, so long as there is a warm inner-chamber to which they can retire as often as they need it. If, however, they are too closely coddled up, as when the cold part of the brooder is kept shut up instead of being clear and fresh, then the tendency is for the chickens' lungs to become weak and much more sensitive to attacks of pneumonia.

When it is found that chickens are dropping off one after another in a foster-mother or brooder, a post-mortem examination should be made and if that reveals any signs of lung trouble, the ventilating arrangements of the brooder should be examined, and if it is found that the ventilation is in any way defective or insufficient, or that the number of chickens is in excess of the number that can reasonably be accommodated; then the matter should be remedied at once. Another point to investigate is the matter of lamp-fumes. Many brooders are so constructed as to convey all fumes outside the brooder without allowing them to pass into any of the chambers, so that the warmth is due to warm air. This is, of course, the only right principle upon which to construct a brooder; but even then it is important to see that the outlet for fumes is not so placed that the fumes can make their way in " puffs " into the machine itself. This will often occur by reason of the position in which the foster-mother is placed and the direction of the wind. Unless matters of this kind are properly investigated, and, if necessary, remedied, there will always be a high percentage of mortality amongst chickens.

Now as to the best way to cure this complaint—if, indeed, it can be cured. Unfortunately, as a rule, the pneumonia either is not recognised in time, or it comes on so suddenly that the end is there before there has been any chance of doing anything effective to stop it. First of all, then, it is important that

THE SYMPTOMS OF PNEUMONIA

should be recognised. They are not altogether easy to distinguish, but by the aid of a clinical thermometer a very shrewd guess can generally be made, and that in good time. It may seem rather curious to talk about a clinical thermometer in connection with poultry, but there is nothing in the least degree absurd about such a suggestion. I am writing for the benefit of poultry-keepers who have valuable stock which they do not wish to lose so long as anything can be done when illness appears. A clinical thermometer costs about three-and-sixpence. It will tell you *at once* what is the temperature of a fowl's body. The knowledge of what that temperature is will often suffice to let you know whether the fowl is in danger of death. A fowl's normal temperature is about 104 degrees Fahrenheit. If, when the bulb of the clinical thermometer has been inserted in the vent or under the wing for about three minutes, the register records a higher temperature than that, you have evidence that the bird is feverish—which means, in other words, that there is inflammation somewhere, by reason of which the bodily temperature has been raised. Now, if a bird is known to be suffering from bronchial or lung trouble of any sort, an abnormally high temperature surely indicates at once that inflammation has set in, and that inflammation in all probability is in the lungs.

ITS CURE

Now, the one essential to the cure of all lung troubles is to be found in the provision of a moist warm atmosphere. I have already explained why it is so in a former chapter. Suffice it, therefore, to say here that a bird affected with pneumonia or inflammation of the lungs—(the terms are synonymous)—must be kept in an apartment where the air can be kept in this humid condition by the employment of a bronchitis-kettle. Apart from that comparatively little can be done. You cannot poultice a fowl as you can an animal: the feathers make it impossible to do so with effect. The only thing you can do to bring the inflammation away from the lungs is to turn back the feathers about the shoulders (in the region of the lungs, that is) and rub in a little turpentine or hartshorn embrocation. But medicine can be given. Aconite tincture in one-drop doses every hour (the dose being given in a teaspoonful of water)whilst the symptoms are acute will tend to reduce the inflammation. It is not desirable to give food of any sort beyond what is just necessary to keep the bird going. A little milk poured down the throat, or egg beaten up in milk, will be best. The acute stage will not last long: twenty-four to thirty-six hours will decide it one way or the other as a rule.

CHAPTER IV.—DISEASES OF THE ORGANS OF ASSIMILATION AND DIGESTION.

How Food is Digested—Composition of Foodstuffs—Feeding for Different Objects—The Value of Exercise—Food Constituents: (1) Nitrogenous, (2) Fatty, (3) Starchy, (4) Mineral—The Science of Feeding—Effect of Domestication—The Crop and Gizzard—The Liver—Intestinal Troubles—Diarrhoea—Dysentry—Constipation—Worms.

Before dealing with the various diseases which affect the organs of assimilation and digestion, it will be well to explain briefly what these organs consist of. The digestive process is carried on in the body of a fowl through all its different stages in one passage or tube, running through the entire length of the body, and the various organs through which this tube or "alimentary canal," as it is called, passes are really enlargements or modifications of the tube itself. There is first of all the mouth, through which the food first enters the body, and from which it passes down the pipe leading from the mouth to the crop, which is known as the oesophagus, or gullet.

HOW FOOD IS DIGESTED

When the food has reached the crop, it there receives the first course of treatment. There are a number of glands from which a peculiar fluid is secreted, which mixes itself up with the food, and softens it ready for further treatment when it reaches the gizzard. If a fowl be fed upon soft food only, that does not make so much demand upon these glands as does food like hard maize; consequently, if the fowl is fed too freely upon soft foods, the tendency will be for these glands, which secrete the fluid in the crop, to lose a good deal of their activity, and so the bird will be inclined to become dyspeptic. Just as machinery which is left unused for a long time gradually gets out of order, so, too, the same thing happens with the digestive functions of a fowl. It is well to bear this in mind, because the tendency nowadays is to feed poultry more and more with soft food and less with grain. Chickens, especially, are being reared in large numbers entirely upon soft food, and I am of opinion that the dry chick food system of feeding is one that is calculated to bring on chickens, perhaps not quite so rapidly, but at all events, to bring them on to a sturdier condition of health. So much, then, for the crop.

As soon as the food has become sufficiently softened in the crop it makes its way onward through an organ, which is really the stomach proper—at least, it corresponds to that organ in animals, although in poultry it is in an undeveloped state. It is called the proventricle. We need not trouble ourselves much about this, beyond noting the fact that it is really nothing more than a small enlargement of the alimentary canal, and it does not appear to play a very important part. It leads on to the gizzard, and it is in that organ that the food receives treatment by the proper digestive fluid, and there it is macerated and ground up, as it were into a form which renders it capable of distribution; the assimilable portions therefrom go into the blood and the waste portions pass on to the intestines, and finally into what is known as the cloaca, which is the other end of the alimentary canal, that has now been traced right through the bird. The intestines, I may say, are very much longer than would be at first supposed—averaging in a full-grown fowl a length of from four to five feet.

The liver and the kidneys are very important organs in the fowl's economy. The liver contains an alkaline fluid known as bile, which is kept in the gall-bladder, and is brought out when necessary for digesting that portion of the food which is fatty in character. This fatty matter in the food is turned into a sort of emulsion by the action of the bile, and so is rendered fit for absorption into the blood. The kidneys, as is the case with animals, are appliances by means of which impurities are collected from the blood, which in the ordinary course comes into contact with these organs. Here, it may be said, that it is very important that fowls should always drink a sufficient quantity of water to which nothing has been added, because pure water greatly assists the functions of the kidneys in collecting these various impurities, which otherwise would be stored up in the blood and make their presence felt in such complaints as pneumonia, liver congestion, scrofula, etc.

COMPOSITION OF FOODSTUFFS.

This is a subject about which the average poultry-keeper knows far too little. It would pay him to devote some considerable attention to the subject of foods and their chemical composition, because if he were to study this subject carefully, he would often find that he is wasting money by the use of foods which do not give the most satisfactory results. Economy in poultry-keeping depends much upon the careful selection of foods. A great deal can be said upon this topic—in fact, it would be quite an easy matter to write a book as large as 100 pages of *The Poultry World*—but what I have to say on this point must be as condensed as possible. I am anxious not to confuse the reader, so shall simply refer to the most important constituents of food, indicate as concisely and clearly as possible what purposes these different constituents serve, and so lead up to a consideration of the proper foods required by poultry in different circumstances. By this we shall see what it is that causes most of the troubles which affect the organs of digestion.

Dealing with the most important constituents of food, we note that these vary according to the purposes they are intended to fulfil in the economy of Nature. There are really three main purposes of food. The first is to supply materials for repairing the bodily wastage that is continually going on; the second to produce warmth, without which the body could not perform its functions; the third to promote the growth of the frame and flesh. The first and the third of these purposes may at first sight appear to be one and the same; but it is not so in reality, as the latter refers to growing poultry, and, of course, has no application to such as are fully developed, except in so far as concerns the fattening of full-grown birds. It may, however, be added that egg production is really identical with the growth of the body; eggs are a surplus product in the fowl's economy, and may be said to be a result of surfeiting with food. Obviously, in order that we may effect economy in regard to poultry, we must endeavour, as far as possible, to supply the necessary constituents in proper proportion, according to the particular objects we have in view.

FEEDING FOR DIFFERENT OBJECTS.

One man wants to feed his poultry for egg production; another to grow chickens as rapidly as may be for the market; a third to promote show form and condition; and yet a fourth wants to feed for smallness (if he keeps bantams) or for legginess (if he keeps Langshans). All these diverse purposes necessitate special consideration, and often it is necessary to effect two or three of them at one and the same time. There must be a proper allowance of all the food substances necessary to sustain life, and an extra allowance of such of them as will tend to turn the scale in favour of the special purpose in view. At the same time, it must be borne in mind that, directly we begin to vary, or in any way interfere with the course of Nature in regard to diet, we shall encourage disorganisation of the digestive functions, and, unless we proceed very cautiously, we shall retard instead of promoting our declared object. Unless, therefore, we attune our programme both to accord with health and with utility, we may as well go back to the old days of our grandfathers, who had no method of any kind, but who allowed their poultry to get along as best they could of themselves.

Now, touching the varied purposes just referred to, we may note that there are several needs common to all—or nearly all—possible cases. It is certain that all fowls require heat in their bodies. The amount of heat-producing food they require varies, however, according to circumstances. If the weather be cold and wet, more heat will be needed to keep up the warmth of the body than would be required in warm weather; yet, even in bad weather, fowls carefully protected from the extremities of cold winds by the provision of suitable sheltering places will need less than they would of heat-forming foods but for such shelter and protection. Again, a fowl is constantly giving off heat in the process of exercise; the more energetic she is, and the more she scratches and forages, the more carbonaceous food she will dispose of. This is important, because it explains why a particular food suits one lot of fowls, but not another lot. Take, for example, Indian corn. If given to fowls which are at complete liberty on a farm, its starchy or heat-forming constituents will be worked off rapidly; but if given to fowls kept in confinement, these constituents will not be called for to anything like the same extent, and the result will be that they will cause congestion of the liver and permanent ill-health.

THE VALUE OF EXERCISE

The moral of this is that all poultry—young and old alike—should have plenty of exercise. Whatever food they take then, it will be digested and dealt with in a healthy manner, without leaving any ill effects. Give them plenty of work, and let them have plenty of room. Exercise is one of the means whereby the oxygen of the air is pumped rapidly into the lungs, and through the lungs to the blood, where it meets the carbonaceous or starchy food, with which it unites; and so it may be said that exercise is one of the most important features of economic poultry-keeping.

So much, then, for the importance of exercise. Now I propose to plunge at once into a discussion of the several principal food constituents. A consideration of these is most essential, because it is necessary that poultry be fed upon a principle that can be varied according to time of year, atmospheric conditions, general state of health, and other considerations, as well as according to the object in view—whether it be chicken-rearing, egg-producing, or exhibition that is being sought after. There are three great divisions into which all foodstuffs may be divided:—(1) nitrogenous, (2) fatty, (3) starchy. A fourth division may, if we so choose, be formed, consisting of the various mineral substances which are to be found in the body, of which more shall be said. Taking these classes in consecutive order:

NITROGENOUS FOOD CONSTITUENTS

They are sometimes called "proteids," and sometimes, again "albuminoids." They all contain in varying proportions five chemical elements—to wit, nitrogen, oxygen, sulphur, carbon, and hydrogen—and by reason of the large percentage of nitrogen in their composition, they naturally take the name of that element. Amongst nitrogenous foods practically every foodstuff might be numbered—that is to say, there are no foodstuffs ready for consumption which do not contain *some* nitrogenous ingredients in their composition; but we will consider those which are specially rich in nitrogen, and which are to be understood as being suitable to give in cases where a good percentage of nitrogenous food is required to be used.

The foodstuffs richest in nitrogen are: (*a*) amongst cereals, peas, beans, tares, and oats, also, in lesser proportion, wheat and barley. The leguminous series of grain (beans, peas, etc.) are richest in nitrogen; but fowls will not, as a rule, eat these as they will other corn, therefore it is necessary to give them in the form of soft food. That is why pea or bean meal should exist as one of the most important ingredients in every poultry-meal. (*b*) Amongst animal substances, milk, green bone, lean meat, and blood are all rich in nitrogen.

All poultry-keepers of experience recommend a percentage of animal food to be given to poultry, and there is nothing better than lean meat fibre or granulated bone (fresh bone—not the white bone-meal which has been obtained by grinding into powder the refuse from button factories, which consists practically of little else but lime, all the phosphorus, nitrogen, and other valuable properties having gone in the course of the chemical processes to which the bone has been subjected by the manufacturer). We thus see that a most excellent meal for poultry can be prepared from the usual meals, provided a good percentage of bean-meal and meat or bone fibre be added. That is the sort of food to give to hens for egg production, and it is also the kind of food best suited to chicken-rearing. So far as grain is concerned, there can be no manner of doubt that the best grain for poultry—old and young alike—is an oat. Experience shows that hens will lay better and chickens grow better upon oats than upon any other corn.

It must be borne in mind that the chief purpose of nitrogenous foodstuffs is to repair the wastage of the tissues of the body that is going on hour by hour and day by day. Laying hens especially need to have a vast amount of this food for repairs, whilst chickens also require plenty of building material to form their frames. The nitrogenous food-constituents are, therefore, the most important of all; no fowl could live long if deprived of them. What would happen to a fowl shut up and fed on nothing but Indian corn? One needs scarcely to ask the question, for so many amateurs have had to pay heavily for doing this very thing. No; the nitrogen is necessary to form, develop, and repair the tissues of the body, and so must be given in considerable quantities.

FATTY FOOD CONSTITUENTS

The difference between albuminoids and fats is that the former contain all the five elements we have already named; the latter only contain carbon, oxygen, and hydrogen. They occur more or less in all foodstuffs, just as nitrogenous substances do; but, in the same way, they are to be found in far greater proportion in some foodstuffs than in others. The object of fats in the animal economy is to produce heat and to assist in the processes of digestion, which they effect by interchanging constituents with the proteids, and by finding carbon to unite with the oxygen of the air which it meets in the circulatory system. Prominent among fatty foodstuffs for poultry, apart from fat meat, may be mentioned Indian corn, hemp-seed, linseed and sunflower seeds. Oats, too, contain a very fair percentage of fat.

STARCHY FOOD CONSTITUENTS

These closely resemble fats in composition, but they differ from them in what we may term chemical percentage, and their functions are very different. They are sometimes called "carbo-hydrates," and may be found in most vegetables in varying proportions. Starch occurs freely in potatoes, in rice, and in most roots. The object of starchy foods may, perhaps, be said, roughly, to be the production of temporary energy. They also assist in the production of heat.

MINERAL FOOD CONSTITUENTS

The last group of food constituents is the mineral. Mineral constituents are to be found practically in every kind of food, but their quantity varies considerably. They are intended by Nature for several purposes; one is to assist in building up the frame, another to supply material for forming the shells of eggs, a third to provide physic to the birds, by furnishing anti-acid and tonic properties, which are exceedingly beneficial. The hen derives the shell material for her eggs from the food—not from the grit, as is generally supposed—at least, not primarly. The food contains its mineral ingredients—*e.g.*, carbonate and phosphate of lime—in an assimilable form. These ingredients pass into the blood, and are carried by the circulatory process into all parts of the system.

When the oviduct is in full working order—that is to say, when the hen is passing through a laying period—the necessary shell-materials are deposited from the cells lining the interior of the oviduct. As, therefore, the egg passes down—or, rather, through—

that tortuous tube, it receives the hard coating it needs. Obviously, since the mineral constituents found in the grain and other food consumed by the bird are more readily assimilable than are the materials, such as oyster-shell, flint, and such-like, which are mainly of use for purposes of digestion, it is easy to understand that the former are first absorbed into the system, and the latter last.

Grass is a good example of a food rich in mineral matter; it contains lime in considerable quantities, which explains why poultry which suffer from the soft-egg trouble when kept in confinement are quickly cured by being allowed to run at liberty in a grass field. Any excess of mineral matter consumed by a fowl simply passes off in the fæces.

The foods which are richest in mineral substances are the best suited for making hens lay and chickens grow. It is worthy of note that the foods richest in nitrogen are also richest in mineral ingredients. For example, there is about three times as much mineral material in beans as there is in Indian corn. The same applies to peas, oats, and other highly nitrogenous foodstuffs.

THE SCIENCE OF FEEDING

therefore is an important one. It involves careful consideration of the ingredients necessary to promote the particular object in mind; but, from the point of view of medical lore, it is necessary to look at the effect of different foods upon the general health of poultry. We may as well face the fact that feeding for egg production or for growth and marketability do not by any means coincide with feeding for health. Eggs, being a surplus product of the fowl, must be provided by a process of overfeeding if they are to be plentiful. The hen in her natural state—living, that is, like the wild pheasant—would be but an indifferent layer. She would produce a very limited number of eggs; but

THE EFFECT OF DOMESTICATION

is to make her more productive, and the science of feeding for egg production lies in discovering how to give a superfluity of food, so as to force laying without injuring the bird's health. As a matter of fact, no hen scientifically fed for egg production can stand the process more than a couple of years. She is then practically worn out. Much the same may be said, though in a different way, of chickens reared for market. The fattening process ruins their digestion ; it can only be carried on for a week or two, and then they must be slaughtered, or they will die of over-feeding. It is important to recognise these facts, but we need not dwell upon them. What we must now proceed to do is to detail and consider the principal diseases arising from foods and feeding processes, and how these diseases may be checked and cured.

THE DIGESTIVE PROCESS

is carried on in what is practically one long tube stretching from one end of the body to the other—beginning at the mouth and ending in the cloaca or vent. This tube at certain points expands and forms the various organs which carry out the different processes of digestion ; but it is, nevertheless, continuous, and it is scientifically known as the "alimentary canal." We will follow this alimentary canal, therefore, and halt at the several expansions to which reference has been made. The first of these is

THE CROP

The crop is found at the bottom of the gullet, and it is there that the food is stopped in its crude state just as it has been swallowed, and there it undergoes the first of the assimilative processes necessary to extract from it the nutritive parts. A fowl in the course of its daily wanderings will swallow a very miscellaneous lot of material : corn and seeds, grass and other herbage, soft solids like bread and mixed-up meal, indigestibles like oyster-shell or flint—all pass together into its crop. The grain and other organic solids are reduced to a pulpy condition, and pass on through the proventricle or "stomach"—a comparatively small organ in the fowl—where they are further acted upon ; then they pass to the gizzard, and ultimately the action of the bile completes the digestive process. Meanwhile the "indigestibles" work their way to the gizzard.

THE GIZZARD

is the final assimilative organ, in the sense of being the last organ in which the mechanical admixture of foodstuffs takes place. Here the sharp, jagged pieces of flint-stone, glass, shell, etc., are collected and converted into grinding-stones by the contraction and expansion of the strong muscular walls of the gizzard itself. As they grind or "grate" together, they mechanically disintegrate and mix the softened, semi-digested food, and leave it ready for the chemical processes to which it must now be subjected before it finds its way into the blood. When these jagged particles have been performing this grinding work for some time their edges become worn, and they slip out one by one, and pass out with the fæces. It will thus be seen that the functions of the crop and of the gizzard are alike of great importance. We do not hear of much gizzard trouble amongst poultry, although there can be no doubt that such troubles do occur. Hard and muscular though the walls of the gizzard are, there must be times at which they are injured by the extraordinary sharp-pointed articles which poultry have been known to swallow. Such injuries, happening to an internal organ like the gizzard, which is practically inaccessible for treatment, are most likely to escape notice. In my own experience there have been numerous occasions upon which the only way to account for death has been to refer it to

GIZZARD TROUBLE.

and here let me say that an organ of this character, like a piece of machinery, cannot be kept healthy and capable of performing its appointed work unless it be kept well employed. The muscular walls will lose their muscularity very soon unless there is a plentiful supply of flinty substance for them to work upon. For this reason, poultry-keepers who do not regularly supply their birds with ample grit make a great mistake. They encourage malnutrition, and that means that they discourage laying. The more vigorous a fowl's gizzard is, the more food it will enable that fowl to digest, and, consequently, the more eggs will be produced, inasmuch as eggs are a surplus product of the fowl's economy, and so the more food a bird can be persuaded to assimilate the more productive that bird will be. It may seem strangely anomalous at first to suggest stones as a remedy for dyspepsia or indigestion in poultry. Nevertheless, it is perfectly true that a supply of grit often is the best remedy for that, since a more rapid digestion is effected, and congestion of the liver and similar disorders automatically relieved. I will now proceed to deal with the several complaints affecting the crop, and first there is what is known as

CROP SICKNESS.

This is a watery condition of the crop, the sac of which is pendulous and its contents always more or less watery. It is indigestion, pure and simple, and is due to wrong methods of feeding and to over-feeding; sometimes general ill-health leads up to the same condition. There is no better course of treatment than to give the bird doses of charcoal, and keep it on fairly low diet for a time in order to allow of the system being cleared thoroughly. Charcoal is dirty, troublesome stuff to handle, and can best be administered in the form of capsules. A fifteen or twenty minim sized capsule morning and night for a week will often work wonders. Charcoal, I may remark, is an invaluable remedial agent to be administered in all cases where there is sourness of crop or anything of that sort (indicated by an unpleasant odour of the breath). Its use, however, must not be continued too long, and after it has been used continuously for a week, it should only be given in occasional doses when necessary.

CROP-BINDING

Crop-binding is simply congestion of the crop, the contents of which, for some reason or other, cannot be persuaded to pass on, and consequently become unwholesome, fermentation being set up, and, unless relief is given, death will follow in a day or two. There are two main causes of crop-binding—mechanical obstruction and indigestion. I have just been making some observations upon the latter, and it is only necessary to add here that when the gizzard is not working properly, or the liver is sluggish, the food naturally does not pass on from the crop with the same rapidity as when all organs are in good working order. The best cure for a condition of this nature is, obviously, to give the organs a rest; and often it will suffice to let the bird have no food for twenty-four hours, but to let it drink freely of water made slightly aperient by the addition of a few grains of Epsom salts. Some birds fatten internally more freely than others, and these are the sufferers from indigestion. Their whole systems become sluggish and irregular, and need some sort of corrective.

Crop-binding is especially prevalent at certain seasons of the year—that is to say, at hay-making time and in winter, when cattle and horses are being fed upon hay. The reason is not far to seek. Poultry are very fond of grass-seeds, and they swallow the spikes of hay in attempting to eat the seeds they contain; these spikes collect like a ball in the crop, and cannot pass further—fermentation is set up, and we get the condition known as crop-binding in its simplest form.

TO GIVE RELIEF

and that soon, is most necessary, as otherwise the fowl will very quickly succumb. First of all, obtain some tepid water in a jug with a narrow mouth, add a grain or so of permanganate of potassium to the water, so as to render it deodorant and slightly antiseptic, and then pour a table-spoonful or thereabouts down into the crop, holding the bird's mouth open and neck stretched in an upward direction. Pour slowly, so as to admit of the fluid being gulped down a little at a time and to avoid spluttering. When this is done, work the crop about with the hand, so as to disentangle the entwined mass as far as possible, and then hold the bird's head downwards and gently press the crop, so as to cause the contents to be vomited. Often this is entirely successful: the congested food, or some substantial portion of it, will be summarily ejected; and a dose of castor oil will then assist in carrying the rest on, and so the patient will recover. If, however, one or two washings-out are ineffective, the only remaining course will be

AN OPERATION

which must only be resorted to when all else fails. The operation for relief of crop-bound poultry is not at all a dangerous one, so long as it is carried out in a careful manner and with due regard to antiseptic considerations. The crop, as we have seen, consists of a bag or sac. In opening it, therefore, it is necessary to cut first of all through the outer skin and then through the crop-sac itself. An incision should be made about an inch and a half in length a little to the side of the ball which the congested crop presents, rather than at the front, for reasons which will be apparent later on. The incision being made by a sharp knife, the contents of the crop should be carefully drawn out by the use of a small bone spoon (such as is used for mustard). When this has been done the crop will need to be washed out with tepid water containing a trifle of permanganate of potassium; then comes the critical part of the work —the sewing up of the incision. Two things here need to be kept in view. It is important that no septic trouble be set up afterwards, and it is also important (especially in the case of a valuable bird) that the wound on healing should not leave a disfigured or pendulous crop. If the sewing up is properly done, the bird should recover completely, and without any trace whatever of the operation having been performed. Great care should be taken not to sew the crop skin to the skin of the breast—the cut edges of the inner skin must be sewn together first, and then, subsequently, the edges of the breast skin. I ought to have said, of course, that it may be necessary to pluck a few feathers from the part before the operation is begun; but only a very few should be removed—the fewer the better, so as to minimise the local irritation as much as possible. In

SEWING UP THE CROP

use silk thread or fine catgut, and employ a needle which has just been heated to redness in the fire or in a gas-jet. Let each stitch be tied separately—do not make a series of stitches all connected. At the most, three stitches should suffice for each skin. After the two skins have been stitched in this way, smear a little carbolised vaseline on the outside, and fix a cardboard collar round the bird's neck so that it cannot reach the place with it's beak.

Let the patient be kept away from other poultry for a day or two, and during that period be careful what food is given. It will be best to keep closely to soft, liquid food, such as stiff oatmeal porridge. Liquids must be withheld for the first twenty-four hours at least, as they will tend to exude from the wound—therefore, instead of giving water to drink, give some thick barley-water of almost gelatinous consistency, which will prevent thirst and act as a safe nutrient as well. No hard food should be given for three days at least. If all goes well by that time the wound should be perfectly healed, and no further anxiety need be felt, provided, of course, that the bird is fed carefully, and is not allowed to stuff itself with hard grain that may swell and cause a new rent in the crop-sac where the stitches were inserted. A few tonic pills or something in the nature of a nutritive, like Parrish's food, may advantageously be given to a bird that is of value in order to assist in bringing it back to condition; but if it is not of much value, it seems hardly necessary to trouble about this, for poultry, as a rule, are possessed of wonderful recuperative powers, and recover rapidly when once set upon the right road.

I think I can now pass on to other diseases affecting the organs of assimilation and digestion. Most important amongst these are the diseases to which the liver is subject.

LIVER COMPLAINTS GENERALLY.

Liver complaint in one form or another is responsible for quite 50 per cent. of the mortality amongst grown-up poultry. It is, in fact, the scourge of adult fowls, just as lung trouble is the scourge of chickendom. Probably more poultry—old and young—die from liver complaint and lung disease than from all other diseases put together. Experts agree that nearly all of the liver diseases from which poultry suffer are due to errors in feeding, although it is perfectly true that some cases are due to chills and similar causes. It is also an undoubted fact that, in a large number of cases, there is hereditary predisposition to liver complaint. We may as well admit at once that there is little hope of lessening the amount of liver complaint amongst poultry, for the simple reason that systematic over-feeding is more or less necessary to encourage egg-production, and hens can only remain perfectly free from all disposition to liver trouble by being kept under natural conditions, which do not tend to egg-productiveness.

I have already dealt with the important subject of foods and feeding, and it is unnecessary for me to reiterate here what I have said elsewhere; but I may point out to farmers and others who use large quantities of Indian corn and rice that these starchy foods are not only of comparatively small value from the point of view of productiveness, but they actually tend, by overheating the blood and by causing congestion of the liver, to stop the production of eggs.

I now come to the symptoms of liver disease and the different forms that trouble takes. I have already referred to the fact that starchy foods tend to encourage it. Some birds, indeed, suffer from what is nothing more or less than

STARCHY LIVER,

This is quite a common sight in post-mortem work, and it is simply and solely due to a wrong system of feeding. Other forms of liver trouble do not present the same appearances—this is the result of maize and rice feeding. Farmers—at least, some of them—seem to think that, because these varieties of grain are cheap therefore it pays to buy them in lieu of wheat, barley, and oats of their own production, which sell for higher prices. Nothing could be more mistaken. The value of foodstuffs for poultry depends not on their price, but on the amount of available nutriment they contain for frame growth and egg production. Now, maize and rice contain far less of these necessary nutriments than do wheat and barley, and especially less than oats contain. Therefore, it follows that instead of being cheap foods they are dear, and, what is worse, they tend to develop this starchy condition of the liver. The liver itself, when in a state of perfect health, is of a rich brown, chocolate-like colour. When starchy, it is more like what is nowadays called "milk-chocolate"—a dull sandy-brown colour—and pastey in consistency, instead of being firm to the touch. This is also known, more scientifically, as

HYPERTROPHY OR ENLARGEMENT OF THE LIVER.

Hypertrophy means over-nourishment, and is the term applicable to the condition which poultry present when they have been over-fed and insufficiently exercised. It is the complaint essentially of penned-up poultry. The liver, owing to defective circulation, resulting from insufficient exercise, is unable to perform the task imposed upon it; as a consequence, it tends to become enlarged by reason of the conversion of its substance into fatty matter. Fowls kept in a semi-wild condition and made to work for their living do not suffer from this disease—it is only the over-fed or confined bird that is likely to suffer from it.

Overfeeding is, to some extent, necessary for egg production; but the secret of success lies in discovering the dividing line between a surfeit that will do no harm and a system of over-feeding that will do harm. The unfortunate fact is that people who over-feed their poultry over-feed them with the wrong things. A study must be made of the science of feeding, and it will then be seen that to over-feed a fowl with maize and similar starchy foods is much more pernicious than to over-feed with nitrogenous foods—in the former case the surplus tends to hypertrophise the liver and to cause fatty degeneration of the heart and other organs, but in the latter it tends to enforce laying, eggs being a product of the surplus food containing the constituents of which they are composed over and above what are needed for physical growth and for the repair of the wastage of the fowl's body.

CONGESTION OF THE LIVER

is the simplest form of liver trouble. It may be nothing more than what we understand by sluggishness, and it is, therefore, quite easy to deal with; but if it be disregarded it may become acute, and acute congestion of the liver ends, as a rule, in inflammation of that organ. Congestion may be due to temporary over-feeding, and then, of course, enforced abstinence from food for half-a-day or more or even the sending to roost supperless may suffice to correct it and give the organ time to recover its usual activity. Again, it may be that insufficient grit is given, and the gizzard, not getting on rapidly enough, prevents the liver from unloading rapidly. Moral: Plenty of grit!

HEPATITIS OR INFLAMMATION OF THE LIVER

is much more serious than mere congestion. It is a condition in which the elements of disease, as it were, all being present, a chill or some other simple influence has precipitated the crisis, and the organ has become not merely congested, but inflamed, and unable at all to perform its functions. Fever has supervened, and death is close at hand. Hypertrophy of the liver ends in this way, so, too, may congestion—indeed, these several complaints are so intimately connected, one running into the other, that it is difficult often to say where the hypertrophy begins and the congestion ends. Perhaps it will be safest to say that wherever there is hypertrophy there must be congestion; but where there is congestion, there is not necessarily hypertrophy. However, we may leave them there, having pointed out how the lesser becomes more severe, and pass on to look at the

SYMPTOMS OF LIVER COMPLAINT

generally. One infallible symptom of this disease is shrinking and darkening of the comb and wattles. I do not say that this does not happen in other diseases—on the contrary, it is a sign of illness of any sort in poultry—but when it is symptomatic of liver disease there is a peculiar purple appearance, due to the defective circulation of the blood, only seen otherwise after death in birds which have succumbed to sudden heart-failure. To illustrate what I mean, let me instance the case of a bird suffering from lung disease. That bird's comb will shrink and will darken—ultimately. But before darkening it will become anaemic, as though the supply of blood were running short in the veins. This will go on for some time, for death does not come rapidly, as a rule, in cases of lung disease; and it is only when the comb has actually shrunk to its smallest capacity and death is very near that the lung-diseased fowl "turns purple." But in liver disease there is no diminution of blood—there is sluggishness of the system, and the blood becomes laden with impurities. Often, too, the yellow colour of jaundice may be discerned on opening the mouth and examining the membrane thereof. A rapid turn to purple, therefore, should be looked upon as a premonitory symptom of liver trouble. Next, a moping, huddled appearance, and distaste for food. Then frequent thirst, although I may remark that this not seldom indicates the acute stage—hepatitis.

Inflammatory symptoms in any organ always mean feverishness, and when a fowl which is ill is thirsty that means that it is feverish, and that, in turn, means that it is likely to die. Another very common symptom of liver trouble is diarrhœa, the droppings being yellow and offensive. Diarrhœa is a symptom of other complaints as well—notable of choleraic and dysenteric troubles—and, therefore, a combination of feverishness and diarrhœa does not necessarily point to liver complaint; but when the droppings are yellow (not gelatinous, as they would be, or blood-streaked, as in enteritis), then liver complaint is recognisable. Now, as to the

REMEDIES FOR LIVER DISEASE.

First, and foremost, put the birds on short diet. Give only just enough to exist upon. They will then begin to feed upon the fatty tissues which the previous over-feeding has created. Next, see that they have plenty to drink—water is essential for the purpose of dissolving all the chemical matter with which the system becomes loaded under the conditions I have been describing. Finally, give medicines likely to encourage or stimulate the liver to do its work. Of these, a mixture of Epsom salts and some solution of iron or steel will have the effect both of clearing and of stimulating fresh effort on the part of the wearied and degenerate organ. If there be diarrhœa, give a dose of castor oil to clear away all the fœtid matter collected in the intestines. Follow this by a few small doses of sweet oil to soothe matters. Above all, give plenty of grit, plenty of green food, plenty of exercise, and study the chemistry of foods and the science of feeding.

PARASITIC LIVER DISEASE (COCCIDIOSIS).

Here I should like to supplement what has already been said upon liver complaint by referring again to that form of which I wrote that it was more or less contagious. A most valuable contribution to our knowledge upon this subject was made by Professor Theobald in the paper he read to the 1907 conference at Reading upon the subject of parasitic liver disease. It is not at all surprising to learn that microscopical investigation has revealed the existence of a parasite which causes liver disease, and it will be surprising to me if it is not found presently that many of the epidemics of liver disease upon certain farms are due to this parasite. Mr. Theobald referred to its effects by the name of "infectious entero-hepatitis," and by entero-hepatitis I understand inflammation of the liver arising from, or connected with, enteric trouble. Coccidiosis is the name that has since been given to it. Now, it is well known that diarrhœa is one of the commonest of all symptoms of liver trouble; and it certainly would appear to be desirable that microscopy could well be employed in determining the presence, or otherwise, of these parasites in practically every case of diarrhœa.

I have known over and over again cases in which the poultry on a farm have begun to die off—especially in hot weather—from what is quite obviously disease of the liver; and the most perplexing question has been why so many should go off rapidly within a short space of time. One could well understand one bird here and there developing hypertrophy of the liver and dying; but when it takes the form of an actual epidemic the case is difficult, and there must be some special reason. Well, here it is. What more reasonable than to suppose that these epidemics are due to this parasite, whose life-history has, in the paper referred to, been so clearly set forth? One hopes that much fuller attention will be given now to liver complaint, and that Professor Theobald's statement that treatment of the disease is impossible, because we cannot satisfactorily diagnose it, was rather too pessimistic. It is now clearly established that coccidiosis infection is derived from the parasites passing out in the excrement. This only shows once more how necessary cleanliness is, and how, to be quite strict, poultry droppings should be removed daily from roosting-places.

Besides noting the specific remedies I have given for liver complaint, it is most important to keep in mind that there is often an hereditary tendency at the bottom of this disease, and no birds known to have been regular sufferers from the complaint should be chosen as stock-birds. Then, too, it is important to attend to such matters as the provision of ample grit—one of the most beneficial of all commodities that can be supplied to poultry, and one too often neglected by farmers under a mistaken belief that the poultry can find all they require when at liberty on grass land. For poultry in confinement grit is equally necessary, and in their case it is also most desirable to provide plenty of suitable green food—cabbages, lettuces, and other garden produce—but, above all, grass which is rich in lime and other chemical salts, will do more than anything else to keep fowls in good health. I have now said all that needs to be said concerning liver disease, and we may continue our subject, which at present, as I may remind the reader, is that of diseases of the digestive organs, by looking at the symptoms of and remedies for

INTESTINAL TROUBLES

under which heading may be classified a variety of complaints, ranging from simple diarrhœa to the more highly complicated typhoid fever, from which fowls are liable to suffer like other creatures. When we speak of the intestines we must bear in mind that these form part of the alimentary canal. It is thus quite correct to speak of the intestines as being part of the digestive system. There are two intestines—the small intestine, which runs from the gizzard to the large intestine, and contains digestive substances which complete the work of assimilation, and glands, which absorb the finished product into the system, leaving the waste materials to pass on to the large intestine, whence they pass into the cloaca, and finally are ejected as droppings.

DIARRHŒA

Diarrhœa or looseness of the bowels is the simplest form of intestinal disorder. It is catarrhal in its origin, and may be said to resemble catarrh of the nostrils, inasmuch as it is caused by irritation of the lining of the organ. Catarrh of the nostrils causes roup; catarrh of the intestines give rise to diarrhœa. It can readily be caused by the presence of sour food or any irritating matter; and it is most dangerous, of course, when resulting from chemical poison, such as arsenic or lead, which set up acute inflammation of the intestines and of other parts of the alimentary canal. Diarrhœa is exceedingly common in chickens, and is a cause, probably, of more deaths amongst young chickens than anything else. In this direction it invariably arises either from sour food or from insanitation in some form. However, the existence of diarrhœa points to the presence of fœtid matter in the intestines; and to get rid of that is to cure the complaint. The best course to adopt is to give the suffering bird a dose of castor oil, first of all. This will clear away the cause of the trouble, and then, if doses of sweet oil be given subsequently, the inflamed and irritated condition of the bowel will gradually subside. The old method of giving chalk powders and mixtures has long since been found to be based upon a wrong theory altogether, they tend to retard rather than to promote recovery. It is obviously absurd to give a gritty substance like chalk for such a complaint. We do not want to add more irritating matter to what is already in the bowels—we want to clear away that which is there at present. The remedies needed are emollients, not irritants—that is why I recommend castor oil, for it both clears and soothes the bowels. Diarrhœa if neglected will soon turn to

DYSENTERY, OR ENTERITIS.

Dysentery is almost incurable in poultry; in chickens it is quite fatal. It can be recognised by the presence of blood in the excreta, which is mostly composed of blood and jelly. This blood shows that the lining of the intestines has been perforated. Life or death depend upon the extent of the perforation and upon the means taken to grapple with the complaint when it is discovered.

How, then, is dysentery to be cured? In the first place we must look to the cause. Is it bad food, as in the case of chickens dying? Is it a bad drain or a sewage-contaminated watercourse, to which the birds have access, or is it some epidemic or contagious disease of tubercular origin—one of those mysterious outbreaks that do put in an appearance sometimes, even amongst healthy stock? Anyway, we must try to discover the cause, and if we cannot speedily do so we must do the next best thing: namely, remove the affected birds to fresh ground, where they are necessarily free from the contamination, if contamination there be. The

TREATMENT OF DYSENTERY.

as applied to individual birds, consists in giving emollients like barley-water—a simple remedy, and one easy to prepare. Let the fowls drink as much of this as they like. It has an excellent effect upon the irritated membranes, and moreover is nutritious as well. Fowls with dysentery must not have any solid food for a day or two; therefore, reliance must be placed to a considerable extent upon barley-water, which accordingly should be made thick—almost gelatinous. It will be found that birds suffering from this complaint are very thirsty—a sign of feverishness—and they will quite readily take barley-water. One or two drops of the homœopathic tincture of aconite will be beneficial in bad cases, as it tends to reduce the fever (which is due to what is nothing more or less than blood poisoning—that is why high fever is always dangerous in man or animal). Occasional doses of pure, sweet olive oil will also be beneficial. Castor oil already recommended for simple diarrhœa, should not be given for dysentery, as its effects are too drastic and there is danger of perforation.

Dysentery may be produced by want of cleanliness about the drinking vessels. These should always be kept absolutely clean and sweet, which can only be ensured by frequent cleansing. Let me say here that drinking vessels should be made of stoneware—not earthenware, the latter being more or less porous and so liable to retain germs of disease. Drinking vessels should always be detachable, so that they can be taken to pieces and the insides cleansed from all fungoid growths, etc.

CONSTIPATION,

Going now to the opposite extreme, from excessive relaxation to constipation of the bowels, this is a far commoner complaint amongst poultry than is generally realised, and often has a prejudicial effect upon laying, because it involves general congestion of the system. It is the result, sometimes, of keeping birds in confinement and allowing them too little exercise, and not infrequently depriving them of that varied supply of green food which is essential to their health. You do not get cases of this kind amongst poultry allowed to roam at liberty in the country—at least, if you do get a case of bowel-stoppage it is due to an obstruction lodged in one of the passages. I have known cases of constipation brought on by other causes, however. As an example, fowls kept in confinement are sometimes given oyster-shell as a special treat—when, attracted by its saltiness and fishy flavour, they will gobble it down as though it were grain, with the result that they become constipated and need a dose of salts or castor oil. I often recommend householders who keep poultry in a garden run to give them coarse brown bread amongst their morning hotch-potch feed. Bran would do as well, the idea being to give them a certain amount of waste material to keep the bowels employed, and so keep them regular. Poultry-keepers should take note of the droppings of their poultry, because these are often an index of the state of the internal organisation. Very few take any notice whatever of this matter, unless and until it is forced upon them.

WORMS

One of the results of constipation among poultry is to be seen in the presence of worms. We do not experience so much trouble in this way in England as the farmers in South Africa, where the complaint exists as a veritable plague; but probably it exists more commonly here than we recognise, and it may account for many of the minor complaints to which poultry are subject. Many attach little importance to the presence of these parasites, but they cannot be looked upon as a healthy sign. All birds should be kept clear of worms, which are productive of a good deal of loss. They not only set up irritation in the intestines, but lower the vitality of the birds. When poultry have worms they will be seen amongst the droppings, then it will be wise to give the whole flock a dosing with suitable medicine. Epsom salts is a good physic, and can be given in the drinking water in small quantities for a day or two. By small quantities I mean just sufficient to make the water brackish and not absolutely salt. If the particular bird suffering from the parasites can be found, it will be wise to give it a special "vermifuge" dose. This can follow the line directly taken by a doggy-man when physicking his canine pet. A five-minim capsule of extract of male fern given when the crop is fairly empty, and followed in a short time (say 20 minutes to half-an-hour) with a brisk dose of castor oil, will always effect a clearance. Where a number of birds are known to be more or less affected, in addition to giving them Epsom salts in the water they should have some carbonate of iron occasionally in their food, iron being a thing that, for some reason or other, is very objectionable to worms.

CHAPTER V.—DISEASES OF THE ORGANS OF REPRODUCTION.

Male Reproductive Organs—Caponising—Female Reproductive Organs—How Eggs are Formed—Egg-binding—How Relieved—Abnormal Eggs—Ovarian Cramp—" Down Behind "—Soft-shelled Eggs.

Before we can deal with the diseases of the reproductive organs, we must see what these organs consist of, and what functions they perform. This subject is one of considerable importance, both from the utility poultry-keeper's point of view and also from that of the fancier who breeds for exhibition. The former naturally wishes to avoid trouble with his laying hens—often the cause of a serious loss in the course of a season—and the latter wishes to produce strong, healthy stock for breeding and exhibition purposes.

MALE REPRODUCTIVE ORGANS

The male reproductive organs (" testes ") are situated far inside the bird, near the kidneys, and high up in the abdominal circle. As a rule, they are unequal in size, one only being fully developed. It is here that the spermatozoa are developed, which ultimately find their way to the oviduct of the hen, and fertilise the ova, which then form the germ in the egg that develops. into a chicken. It is unnecessary to deal here with the development and history of these spermatozoa; it will be sufficient to say that they are minute cyclindrical bodies, with a tail capable of causing movement, very similar in every respect to the spermatozoa of the animal kingdom. And here we may leave this department of our subject, merely observing that the male bird is liable to various testical troubles—inflammation and so forth—which, however, cannot be treated satisfactorily.

CAPONISING

is coming to be recognised as a very important branch of the science of poultry culture. It has been practised on the Continent for many years, its introduction into England as an effective method dates within the last ten or fifteen years. That the operation is a dangerous and difficult one, unless skilfully performed, will at once be obvious when we consider how the organs to be removed are situated, as it were, a long way inside the bird; but it is easily done when properly understood and practised. Moreover, there can be no doubt whatever that cockerels treated in this way both grow more rapidly and reach a much heavier weight as table birds. As there are now several firms who supply proper caponising instruments, with clear and full instructions for use, it appears likely that the practice of caponising will become general ere long—at least, on farms where any considerable profession of table-chicken-rearing is made. The most perfect table chickens, of course, are those which, after caponising, have been fattened off on the well-understood cramming system now generally adopted.

As to the caponising operation, I may first of all suggest that the amateur would be well-advised to learn how to do this thoroughly by experimenting on dead birds before he ventures to try it upon a living subject. The instruments he will require include a scalpel-knife, a pair or two of forceps, and a spoon hook, also some silk thread and a surgical needle. The operation cannot be performed by a single individual; an assistant must be present throughout. The operation is best done in cool weather—not in hot nor in frosty weather—and the best age for operating is between 3½ months and 4½ months old, although it can be done earlier, though not so satisfactorily. The bird is laid upon a table with its left side uppermost, and, the left leg drawn backwards toward the tail, an incision is made into the abdominal cavity, large enough to admit two fingers. The incision should begin at the edge of the hindmost rib, the knife being used as close as possible to the bone, and care being taken not to injure any of the intestines. The incision having been made, one of the fingers should be gently introduced, and should be passed upwards towards the spine, on either side of which the testicles can be felt, about the size of a horse-bean. These are then removed by the instruments, great care being taken that neither of them slips away among the intestines, as that would inevitably result in inflammation and the death of the bird. After removal of the organs, the wound in the flank must be carefully stitched up, in precisely the same way as was described in dealing with cases of crop-bound. Absolute cleanliness and all antiseptic precautions must be observed. Any injury to the intestines—even a needle-prick—will be dangerous. After the operation, care must be taken to keep the bird perfectly quiet in a show or hospital pen, and he should be put on low diet for three or four days, by which time the wound ought to be healed sufficiently to justify his being set at liberty, and he will soon begin to grow.

The process of caponising has its counterpart, so far as pullets are concerned, in the operation of severing the oviduct, which is recommended by the best authorities as being preferable to the French method of removing the ovary entirely. It is said that the severance of the oviduct entirely stops the development of the ovary. The operation to effect this consists in making an incision in the flank, as in the case of a cockerel, when the ovary will be seen, and from it the oviduct, which can readily be severed.

FEMALE REPRODUCTIVE ORGANS.

These consist really of two organs only—the ovary and the oviduct. There are at first two ovaries, and they can be traced even in the developing chicken before it is hatched; but, as a rule, only one of these ovaries—the left one—develops to maturity, the right one remaining in its embryonic state. The mature ovary is an unevenly-shaped bag, to which, at maturity, are attached the ova or eggs. These develop one by one, and, when ripe, become detached, and slip into the oviduct—a long, twisted tube, running down to the vent—or, rather, terminating in what is known as the cloaca—the open space inside the vent.

HOW EGGS ARE FORMED

Each ovum then ripens in turn, and starts on its passage through the oviduct. At that time—*i.e.*, when it becomes detached from the placenta or wall of the ovary—it consists practically of what we term the yolk. The white is deposited around it as it makes its way through the oviduct, and fertilisation has necessarily taken place, if not actually within the ovary, at least just at the commencement of the oviduct passage. The oviduct is divided into two parts. The first portion of it through which the egg passes is more delicate in structure—thinner-walled—than the second portion, which is strong and thick-walled. It is in the former that the white or albumen is deposited, and in the latter the shell is deposited. An egg takes from three to five hours to pass through the first portion, and from fifteen to twenty hours to pass through the second stage. It is then complete with shell, slips into the cloaca, and is then laid. Variations in the shape of eggs, and variations in quantity of albumen, thickness of shell, average of fertility, and so forth, naturally can be accounted for only by the individual bodily structure and caprices of individual hens.

Having now described both ovary and oviduct, and having explained also how eggs are formed, and how they develop until they are complete for expulsion, I proceed to deal with the common or every-day troubles which the poultry-keeper experiences with his laying hens. These troubles vary according to the time of the year. Thus, for example, when a large number of young pullets are coming on to lay in the early part of the year, there is the likelihood of a considerable number of cases of egg-binding—a trouble to which pullets are often liable during the early portion of their utilitarian existence. Then it may be said that these egg-troubles vary according as poultry are young, middle-aged, or old. What I mean is that there are more cases of egg-trouble amongst young and old birds than there are amongst hens in what may be termed their prime—*i.e.*, from a year up to, say, two and a half years.

EGG-BINDING

Egg-binding arises principally in two ways—either the egg-passage is too small to permit the passage of the egg or the egg has become broken, and will not slip out properly in consequence. Parenthetically, it may be remarked that the latter is the more serious case. Now, I have already observed that young and old hens are most liable to this egg-binding trouble; and the explanation is that in young hens the oviduct has not become sufficiently dilated to enable them to pass their eggs freely until they have been laying for some time, whilst old hens are pre-disposed to lay abnormally large eggs—double yolks often finding their way from the ovary into the oviduct—and, of course, there is in their case, too, the natural weakness of age, which nowhere becomes more apparent than in their egg-organs. The oviduct of a pullet when she first begins to lay is but a narrow passage, and the first few eggs will not find their way through without causing the bird considerable pain and difficulty. Every poultry-keeper is aware of the fact that a pullet's eggs at first are long and narrow, and, as a rule, more or less streaked with blood. The reasons are obvious—the resistance of the narrow passage makes the egg long-shaped, and the rupture of small vessels as it forces its way through and distends the passage accounts for the blood-streaks. The first egg always shows these characteristics in their most pronounced form, the second and third less so, and then gradually the eggs become rounded instead of long, showing that the oviduct has been stretched to its normal capacity.

With regard to the old hens, the reasons why they lay large eggs are, firstly, that they get fat and lazy, and secondly that their oviducts have become widely distended, and there is, consequently, a greater tendency for two yolks to become combined to form a single egg. Then, again, there is more likelihood of a diseased condition, and inflammation is likely to occur more frequently with them than with healthy younger hens. So the middle-aged hen suffers less from egg-binding than either her mother or her daughter. On the one hand, she has not become worn out, and, on the other hand, her oviduct has reached its normal size. The explanation is quite a simple one.

HOW EGG-BOUND HENS MAY BE RELIEVED.

When a hen is egg-bound she will generally spend a great deal of time on the nest, or in going to and from the nest, and when she is tired of that she will be seen moving slowly about in evident distress, trying every now and then to deliver herself of the egg. The first thing to do is to ascertain whether the egg is intact or broken. If intact, it will be one of abnormal size (unless for some reason there be inflammation in the oviduct, and then even an ordinary-sized egg will only be laid by effort and great pain), and it can readily be felt, as a rule, close to the vent ; but, if broken, then some of the contents will, in all probability, be seen exuding from the passage. If this should, unfortunately, be the case, the greatest care will be needed to prevent a catastrophe, for escape of egg-substance may set up inflammation and gangrene, or peritonitis will speedily ensue, followed by death. The first thing to do in such a case is to draw out most cautiously any portions of the broken shell. Before attempting to do so, however, the operator should gently insert into the vent a feather liberally soaked with sweet oil. As a rule, it is only necessary to get hold of a piece of shell, and by very gentle effort the whole can be drawn out. Afterwards the hen should have a good strong dose of castor oil, and she should be kept quiet, though not cooped up, which means that she should be put into a small run by herself where she will be free from interference on the part of the other fowls.

DELIVERING AN ABNORMAL EGG

Where, however, the trouble arises from the non-delivery of a very large egg, mechanical means will have to be employed. The hen's vent should be exposed to fairly hot steam as a preliminary. Next let a soft feather well saturated with oil be introduced into the passage in the manner already described, and the hen may then be left to herself. Should the egg not appear in the course of a few hours or so, a further steaming and oiling may be tried ; but great care should be taken to guard against any fracture of the egg. I have never known a case in which the hen did not ultimately succeed in delivering herself after this slight assistance had been rendered. Those cases where the bird had died from egg-binding have generally been cases in which there has been too much interference, or it has been too premature. Some people are very fond of interfering in matters of this kind—usually in the most clumsy and ignorant manner possible —whereas, if left alone, Nature would have effected what was needed ; and, as in the case of young fowls particularly, whose oviducts are not as yet fully dilated, there are often symptoms which indicate egg-binding several hours before the egg has made any real progress through the resisisting oviduct. It often happens that a hen is supposed to be in need of help when all that is needed is time. I do most strongly advise those whom it may concern to avoid interference of any kind until it is quite clear that the hen is badly in need of it, and is, indeed, becoming exhausted.

OVARIAN CRAMP.

is a condition in which the afflicted bird is unable to rise, owing to the fact that a sort of temporary paralysis has seized its legs. This most frequently occurs to young hens when they have only been laying for a short time. As explained previously, the oviduct is some little time before it becomes fully expanded so as to admit the passage of eggs freely, and there is no doubt this cramp or paralysis is one of the results of the resistance at first offered by the strong walls of the oviduct to the eggs. However that may be, the treatment of such a case is very simple. The hen must be kept perfectly quiet, and a dose of castor oil may be given by way of clearing the system generally; then the cramp will gradually disappear, and may never return. It ought to be said, beyond this, that, although it is commonest for this malady to occur to young pullets, it does sometimes occur to hens which have been laying too rapidly, and consequently have weakened themselves, and their egg-organs are more or less, so to speak, physically exhausted. But in older birds this exhaustion usually takes another form, and that we will next consider.

"DOWN BEHIND."

This is a well-known condition, in which a portion of the intestines protrudes. It is generally due to straining, and most often happens to hens that have been over-laying. The only thing that can be done is to gently oil or vaseline the part, and carefully re-insert it. Having done this, put the patient into a hospital pen, and keep her there for a week or more, only giving a moderate allowance of food, in order to check the production of eggs for a time. It is, of course, most necessary that this latter object should be achieved, because the whole tendency otherwise will be for the weakened part to burst out again. Sometimes a hen will fall victim to this trouble after laying an abnormally large egg—probably because the egg-passage will have been so much extended that it will not, so to speak, settle into place again all at once. But it will do so by degrees if she be kept quiet and undisturbed.

SOFT-SHELLED EGGS.

Some poultry-keepers suffer a great deal from this plague. It really is nothing more or less than a form of abortion, and is as troublesome to deal with as is abortion in cattle, for some hens seem predisposed to it, and cannot be cured, whatever is done for them. In a broad way of speaking, it may be said that soft-shelled eggs originate in one of three causes: (1) Want of shell-forming material; (2) sudden fright; (3) constitutional debility. We will take each of these in turn:

Want of Shell Material.—This heading may be utilised to cover what might, perhaps, have been looked upon as a separate cause; I mean, over-production. Obviously, if a hen produces eggs in such rapid succession that the shells are not properly formed before they are pushed on by others following behind, the result is easy to understand. This, however, comes under the same general principle—*i.e.*, that a hen, if she is to "shell" her eggs properly, must have in her system an ample supply of lime salts for the purpose. These lime salts are present in the blood. They come originally from the food, and when they get into the blood they are carried along until they find a resting-place in the walls of the oviduct, where they remain until they are wanted for the eggs. Now, it is obvious, even to an unscientific reader, that the circulatory system of a hen will accept, first of all such lime as it can get in an assimilated form; this it gets in grain and other foods. When that has been made use of, it will take up cruder material, such as can be got out of grit, shell, etc. Now, grass contains lime, and I have known hens to be cured of the soft-egg habit by simply letting them run out of confined pens into a grass field. Therefore, care should be taken that all hens have a suitable supply of lime, preferably plenty of oats (which contain—as does wheat—lime in good percentage).

Sudden Fright.—Hens suddenly frightened or hens which meet with accidents, such as falling from a perch, will often abort—*i.e.*, discharge the partly-formed egg before it is properly ready. Above all things, laying hens should be kept as quiet as possible. Even much interference from cocks—especially active young cockerels—is undesirable, and many poultry-keepers have testified to the fact that hens will lay better when they are entirely freed from the attentions of male birds.

Constitutional Debility.—It is easily intelligible that a feeble or worn-out hen will not be able to perform her functions as satisfactorily as a healthy, active, young bird can. When Nature is weary and exhausted, the very first thing she does is to lose the power of reproduction; and in hens this means that the egg-organs become debilitated and unable to do what is required of them. Hence, the first sign is the stoppage of the lime supply—it is no longer secreted properly. There is no cure for this.

CHAPTER VI.—BLOOD DISEASE (TUBERCULOSIS).

Consumption, or "Going Light"—Scrofula—Sores and Eruptions—Wing Disease.

CONSUMPTION, OR "GOING LIGHT."

Tuberculosis and scrofula are identical complaints, more or less hereditary in origin, and both are very familiar to poultry-keepers under the name of consumption, or, as it is sometimes called, "going light," in reference to the wasting nature of the disease.

Now, the difference between tuberculosis and scrofula is this, that the former generally makes its appearance in the internal organs, whilst the latter shows itself as an external eruption in some form or other. We may, therefore, leave scrofula out of our consideration altogether, and deal here with tubercular disease as it affects the lungs. The word tubercle of course, indicates a little tuber, and the disease is so called because it appears in the form of small, cheesy-looking nodules, which take the place of the lung-substance, and in course of time completely eat away the lungs, and even the heart. I have seen cases in which the lungs and heart all presented the appearance of whitish-yellow bodies. Now, it is quite obvious that disease of this kind cannot be cured by such methods as have been recommended for the relief of bronchial affections. Indeed, it is doubtful whether there is any cure whatever, except for cases taken in their earliest stages. Prevention is better than cure. Breeding only from sound, healthy stock, and keeping fowls under health conditions as regards housing—these are the two preventives of consumption. Oxygen—the fresh, life-giving air—is Nature's charm against tubercular disease. The lungs, I may add, are the most frequent seat of this complaint. It may, however, appear in the liver or the intestines, but we shall see more of that presently when we come to those branches of our subject.

SCROFULA.

Scrofula takes various forms, but it generally appears as a running sore, either on the breast-bone or on the foot (commonly termed "bumble-foot"). It is really another form of tubercular disease or consumption, and, as such, attacks the lungs in the form of little tubercles, or, in the alternative, comes out of the blood in the form of swellings and eruptions in the joints and upon the skin. This complaint is much more prevalent amongst some breeds than amongst others, the reason being that some breeds are much more unhealthy, by reason of the prevalence of in-breeding, which reduces the vitality and health of the common stock. Scrofula, therefore, like tuberculosis, may be said to be more or less hereditary, and it is most desirable that the poultry-farmer who goes in for utility purposes should weed out from among his stock any birds that show the least symptom of anything of the sort. Amongst the breeds which are very prone to this complaint, may be mentioned Indian Game, Spanish, Hamburgh, and Modern Game. These are breeds that have been in-bred for exhibition purposes, and the effect of this in-breeding has been to reduce their general standard of health. In a general way, the treatment for scrofula consists in giving saline aperients, such as Epsom salts or sulphate of soda, in a life of absolute freedom and very limited diet; but there is no satisfaction in trying to improve birds—at all events, for laying or table purposes—that are affected in this way, and the best plan is to breed it out as speedily as possible.

SORES AND ERUPTIONS.

I now deal with that form of scrofula in which the disease takes the form of a running sore or an eruption on the skin. The constant knocking or rubbing against a perch will bring a sore on the breast-bone if the bird happens to be at all disposed to that sort of thing. There are numerous ways, however, in which sore places can be started, and perhaps one of the commonest is by fighting. The best way to treat a sore or scrofulous eruption—which, if not dealt with speedily and effectively, will develop into an old wound—is to wash it from time to time with a weak solution of carbolic acid, or with a solution of coal-tar or permanganate of potash, preferably using warm rather than cold water for the purpose; and after this bathing with lotion, apply to the place a small quantity of some antiseptic, such as carbolised vaseline, or boracic acid ointment. If the wound or sore be an old one, and discharges badly, the best thing to use is iodoform ointment, that being a very powerful antiseptic. At the same time, the bird should have some internal medicine of the saline type.

Before I leave the subject, I should like to refer to the importance of careful dieting of poultry where there is anything of a tuberculous or scrofulous character prevalent. I have known many cases to be brought on by in-breeding. I have also known cases in which the complaint has been induced by giving unsuitable food, such as Indian corn or rice. It may also be induced by want of proper ventilation in roosting-houses.

With regard to feeding, what I want to emphasise is this—that Indian corn and rice, although they are cheap foods, yet in the long run are very dear for poultry-feeding. A farmer gets plenty for his money, but it is not the right sort of food that will either make his poultry lay or keep them in reasonable health. What he wants to do is to give them food that will make the young grow and the old lay, and these starchy foods will not do either. All they do is to produce internal fat, to make the liver sluggish and the blood impure.

The best way to deal with birds that have any tubercular or scrofulous trouble hanging about them is to give them very little food, and what they do have should be something like oats or buckwheat or barley of the very best quality, and they should be made to work hard for their living. There is nothing like making poultry exercise themselves to keep them healthy, and they should not be encouraged to hang round the back door, but should be made to scatter themselves out over the farm, and to find the greater part of their own living in the grass-fields. They should also have a small quantity of iron in some form put in the drinking water. What is called "Steel Solution" will do well.

WING DISEASE.

I now come to the last of the complaints of a scrofulous nature to which I propose to refer. Wing-disease shows itself in the appearance of a tumour underneath or above the wing joint. It may often be brought on by a bird striking itself against netting, a perch, or any other hard substance, and it is very difficult to get rid of, because it seems to settle in the joint, and that joint at once becomes a centre for the operations of all the scrofulous matter there is in the bird's system. This tumour also becomes hard, and it really cannot be cured in many cases. I have found that iodide of potassium ointment is a good thing to apply to these tumours. This ointment should be rubbed on two or three times a day, and the bird should be well physicked internally. In some cases a linseed poultice should be applied to the lump by way of softening it, and inducing it, if possible, to discharge. If it will come to a head and discharge, so much the better; when the discharge has ceased, the place should be well syringed with carbolic lotion, and should be packed with a little cotton-wool saturated with iodoform.

CHAPTER VII.—PARASITES AND EXTERNAL COMPLAINTS

Parasites that Trouble Poultry—Feather Troubles: Moulting—"Rotten" Feather—White Comb—"Bumble-foot"—Scaly-leg.

PARASITES THAT TROUBLE POULTRY.

This is a comprehensive title, and it is intended to cover things as widely apart as feather disease and parasites. It will, perhaps, be convenient if we deal first of all, with the troubles due to the presence of fleas and lice and other vermin. There is no necessity for entering upon a dissertation on the varieties of parasites that trouble poultry. It is sufficient to say that in the case of adult fowls, fleas are the principal source of irritation, whilst chickens are seriously interfered with by small lice. The presence of fleas may always be looked for, particularly as the weather begins to get warmer, and their presence is generally indicated by small specks of blood on the eggs. Naturally, they are to be found in large numbers in the nests, and it is quite an ordinary occurrence for eggs to be literally speckled all over with small spots of blood, which are due to the fact that fleas have been biting the hens when they have been on the nest, and these blood-spots result in consequence.

The best way to keep nests clear of fleas is to dust them occasionally with a little sulphur, and it is also advisable to have movable nest-boxes, so that they can be taken right out of the poultry-house from time to time and cleansed by setting fire to the hay and other material inside them, by doing which the insects and their eggs will be completely burnt out. I need not dwell upon this topic. It is quite evident that it is undesirable to allow poultry to be interfered with by vermin in this way, particularly where there are sitting hens, because they cannot sit comfortably and quietly upon their eggs if they are plagued by any such nuisance as this. I might also observe here that Nature has provided a means whereby the feathered race can get rid of their unwelcome guests. I mean the habit of dusting themselves.

Wherever poultry are kept, dusting-places should be provided; a little shed or covering of some sort, under which a barrow-load of coarse sand can be thrown, will suffice. Here the poultry can come and dust themselves, shaking and sifting the sand through their feathers in such a manner as to clear out any insects that may be upon the skin. It is a good plan to throw a little powdered sulphur down into the sand provided for this purpose, as that will tend to assist the ordinary process of Nature.

Passing now to the small lice which affect chickens, it may be said at once that this is one of the commonest causes of mortality. More young chickens die from the effects of vermin than any other cause, the reason being that these creatures simply eat away the vitality of the chickens, and prevent them from thriving. Many a farmer's wife has been puzzled to know why her young chickens die off so rapidly, when, if she had but recognised the fact that they were swarming with lice, there would be no mystery about it. The first thing to do when a chicken is ill or ailing is to ascertain whether there are any lice upon its skin. They are generally to be found round about the head and neck, and also on the thighs and the legs. If, on examination, it is found that they are present, the best thing to do is to dust the chicken well with insect-powder, and also sponge the parts where they are found with a little quassia solution, which is very destructive to them.

FEATHER TROUBLES: MOULTING.

So much for the parasites that affect poultry. I need hardly say that, in order to keep perfectly clear of these things, it is most desirable that several times in the year all poultry-houses, nesting-boxes, and chicken-pens should be thoroughly cleansed and disinfected. Vermin ensconce themselves in the cracks and crevices of poultry-houses, and unless they are dislodged, they will constantly issue forth from these recesses, and cause interminable trouble. Lime-washing, and soft-soap, and carbolic acid and other vermifuges should, therefore, be used liberally from time to time; and there is nothing, after all, more effective than to shut up a poultry-house, and put some sulphur on a shovelful of hot coals and let it burn itself out inside. The sulphurous fumes will kill anything; and will penetrate every crack and crevice, driving out and slaughtering the inhabitants thereof.

We will pass now from the skin to the feathers. I need say very little about moulting; that is a natural process which occurs every year, and it is generally less troublesome to young poultry than to old ones. It is got through best by keeping birds warm and feeding them liberally, and one can hardly regard it as coming within the classification of disease. It is perfectly true that there are some cases in which birds are subject to what is called "slow moult." They are generally old birds, or for some reason or other they contract a chill during the natural process, and their feathers refuse to come out in the ordinary way. Such birds can, as a rule, be put right by removing them to a warm place, and by giving them doses of linseed-oil freely. I must pass on, however, to what are really feather diseases.

ROTTEN FEATHER.

This is a well-known and characteristic disease of the feathers, and it is shown by the gradual decay and disappearance of the web of the feather, which makes it look as though it has been nibbled away by insects. No doubt, there is a parasitic feather disease, and that is due, probably, as much to ill-health and insanitary conditions as to anything. One rarely sees a case of rotten feather in the country, although sometimes it has been known to break out. It is generally to be seen amongst poultry kept in dirty, ill-lighted, unwholsesome pens in back-yards and gardens. Poultry kept under such conditions as these are not likely to thrive or to be healthy, and the only way to deal with cases of feather disease imported from such quarters is to get rid of the birds affected, and see that the rest of the flock have more exercise in the open air, and that they are housed and fed in the best possible way.

Sometimes there will be a mysterious disappearance of some parts of the feathers of poultry, which will lead their owner to suppose that they are suffering from some form of feather disease. Such cases, however, generally prove to be false alarms, and further investigation will, in all likelihood, reveal the fact that mice are at the bottom of it ; for mice are very fond of nibbling at anything they come across, and as often as not they will nibble the feathers of fowl sitting at roost.

WHITE COMB.

This is a parasitic trouble, and it is a very unpleasant disease to get amongst poultry, for it spreads with alarming rapidity, and only the most drastic treatment will get rid of it. Let me explain what white comb is. It has nothing whatever to do with paleness of face, such as when the comb of the bird appears to be bloodless, as is sometimes the case with birds of the large-combed varieties. It is a scurfy eruption, due to the constant peeling off of the skin of the comb, and it is not unlike the disease known to the human family as eczema, except that it does not present a red appearance of the skin. There is a constant look as though flour had been dusted on the bird's comb, and sometimes an actual eruption or running sore will start if the remedies used have been too drastic. There is thus the danger of having to use drastic measures, and yet at the same time run the risk of making things worse. However, half measures are of no use whatever.

The best thing to do in a case of this kind is to saturate the comb, first of all, with paraffin or turpentine, and when this has been done, rub it over with carbolic ointment. Repeat this process morning and night for three or four days, and then, in all probability, some permanent effect will result, and the bird will be better. At the same time, it is necessary that there should be some internal treatment as well, because this complaint seems to have the effect of reducing the poultry to a very weak and debilitated condition. An occasional capsule of cod-liver oil and quinine should be given, and the bird should have a saline tonic, such as Glauber's salt, in the drinking water. This disease is generally communicated to farm-yards by birds which are bought from public markets. It originates in dirty, insanitary conditions, and, unfortunately, when a farmer gets the complaint amongst his poultry, he begins to sell them off, and sends the best-looking of them to a market, where they are sold and distributed in different directions, with the result that they carry the disease with them and cause a considerable amount of mischief. There ought to be some means of preventing this in markets, just as there are means of preventing sheep-scab and other cattle complaints, for the conveyance of disease from one poultry-yard to another often involves people in very serious loss.

BUMBLE-FOOT.

There are a good many cases of bumble-foot to be seen amongst poultry. The trouble itself is really a swollen condition underneath the foot—the ball of the foot, in fact—and this gradually hardens, and soon a very nasty substance forms. The way in which the complaint is brought on is very simple. A bird may be in a more or less unhealthy condition so far as its blood is concerned, and it may scratch the ball of its foot against some little notch on a perch, or it may tread on a piece of glass or metal, thereby causing injury to the ball of the foot, or it may even damage itself by fighting, and then inflammation is set up, the unhealthy condition of the blood centres itself, as it were, in the injury, and this swelling and substance are quickly formed. The way to cure a case of this sort—and I should only recommend curing if the bird is a valuable one—is to poultice the foot with linseed-meal several times, in order to soften the lump and then cut it open and remove the core, after which it should be syringed with carbolic lotion, and a little simple ointment can be applied to heal it up. The bird's foot will have to be bandaged for several days and it must not be allowed to attempt to rest on a perch, but put into a small pen where it will be obliged to squat down on the floor to rest.

SCALY-LEG

This is another of the common complaints that affect poultry, and most people who have had experience of fowls will know what it is without my describing it very minutely. Scaly-leg really can be divided into two forms—the parasitic form and the scrofulous form. I need say nothing about the latter, beyond this—that it often appears on scrofulous subjects as an accompaniment of bumble-foot and skin complaints generally. But with regard to the parasitic form, which occurs in 999 cases out of every thousand, this is an example of how insects can do mischief if they are not checked at their first onset. Scaly-leg is generally started in what I may term a mechanical way.

If you look at the scales on a fowl's leg, you will see that they fit together as closely and neatly as do the scales on a fish's back; but if you were to scratch one of them off, it would be a long time before it was replaced by another. The scales on the leg of a fowl are most perfect and compact when the fowl is young; but when the bird grows older, there is a disposition for them to expand and grow almost like nails on a man's hand. This disposition is increased very often by the conditions under which the bird lives. An active hen, who is constantly scratching about, will very often make the scales on her legs rough, particularly if she is allowed to scratch, as many poultry are, amongst ashes or cinders. These contain a certain amount of potash and other chemical substances, the disposition of which is to act upon the scales of the legs.

As a hen grows, grit and dirt begin to make their way in between the interstices of the leg-scales and gradually forces them apart. Now comes along a little insect known as the scaly-leg parasite; takes up its abode underneath the scales, and sets up irritation and a sort of floury eruption. This parasite generally finds its way from one fowl to another through the medium of perches, which shows how important it is for the perches of the poultry-house to be not fixed, but movable, so that they can be taken out from time to time and be thoroughly cleansed with hot water and disinfectant. When once the insect has taken up its abode in this way, it will spread very rapidly, and the victim soon looks very unattractive. Scaly-leg is so unsightly that every poultry-keeper is glad to be rid of it as soon as possible.

There is something very attractive in the olive colour of a Game fowl's legs, for instance, or the glossy black of a Minorca pullet's legs; but when that colour is exchanged for a nasty, lumpy, floury, eruption, the birds lose half their charm, and when the eruption becomes very bad indeed, the health of the bird suffers.

The way to cure scaly-leg is to get some hot water and a nail-brush, and thoroughly scrub the legs, opening up the scales, cleaning out all the dirt that is under them, and scraping away as much as possible of the eruption—in fact, all that can be scraped away without making the bird's leg bleed. When this has been done, thoroughly saturate the legs with paraffin oil, and after that, anoint them with sulphur ointment. It is a good plan to bandage the legs up for a short time and make the fowl lie on its breast, so that it cannot get the ointment off until it and the paraffin have had time to take effect. When the bird is released, it should not be allowed to run out with the others, but should be kept in a pen on some soft hay, or, better still, put into a chicken-pen on grass, where it cannot scratch about. The same process can be repeated on the following day, and after three or four dressings a cure will probably be effected. Show birds ought to have their legs dressed from time to time with a little oil, after being washed with soap and water. If the legs of exhibition birds are regularly attended to in this way, they will never get scaly-leg. It is a pleasure to go round a poultry show, and find, even amongst the old birds, some whose legs are practically as sound in scale as they were when they were quite young pullets.

CHAPTER VIII.—ACCIDENTS AND SURGICAL OPERATIONS.

Poisoning—Injuries (External)—Injuries (Internal).

Most poultry-keepers have had experience at one time or another of more or less serious accidents happening amongst their poultry, and, as these accidents are liable to occur at any time, it is necessary that the poultry-keeper should know how to set about rendering first aid. If a bird, for instance, puts its wing out of joint or breaks its leg, and its owner is a handy man who can spare the time to deal with it, there is no reason why an effective cure should not be brought about with comparatively little trouble. The important point is to deal with an accident at once, before the limb—if it be a limb—has had time to set into a different position; for let it be borne in mind that the flesh and the bones of healthy poultry have a marvellous vitality about them, which enables Nature to set herself right in a very short space of time. I propose now to give a few particulars of the treatment that should be adopted in regard to some of the commonest accidents to poultry. And, first of all, I should like to deal with the subject of poisoning, because a good many poultry die as a result of that.

ACCIDENTAL POISONING

One often hears a poultry-keeper complain that his birds have been poisoned, because they are dying off rapidly after being taken ill perhaps only a few hours previously. No doubt in many cases it is perfectly true that they have been poisoned, and whether the poisoning is what is known as ptomaine, or whether it be due to the fact that they have partaken of some mineral substance or of some vegetable poison, such as yew-berries, it is not always easy to determine. At all events, as a preliminary, if birds begin to die at the rate of so many an hour, the first thing a farmer should do is to open the crop of one and see what it contains; and if he finds it full of some particular kind of berry, he should take steps to prevent the birds getting more, and should also give an antidote to any that he suspects have been partaking of the same things. In some cases, however, there is no poisoning at all, but merely indigestion or liver complaint, as a result, perhaps, of sour food, which, however, might possibly set up the ptomaine poisoning already referred to.

The way to distinguish a true case of poisoning from a case of liver disease is that the poisoning case, as a rule, would be much more rapid in its development than would a case of disease. This, taken in conjunction with other symptoms, as for instance, screwing up the muscles, which is characteristic of strychnine poisoning, or very violent diarrhœa, which might follow lead poisoning (I have known cases in which a number of fowls have been poisoned through eating white lead when painters have been employed about the premises), these very noticeable matters being considered at the same time, will generally afford a clue to what is the real trouble. Now, what is to be done in a case of poisoning?

First of all, wash out the crop, and this can be done by pouring warm water down the gullet by the aid of a small jug with a narrow spout and then, after kneading the contents of the crop about, gently squeeze it out, and so get rid of whatever there may be in the crop. Having done this, give a strong dose of castor oil—a double dose, in fact—so as to carry off any poison that may have got further on, and at the same time give a stimulant, like a few drops of brandy or port wine, and trust to these measures to save the bird. If, however, the particular kind of poison is known, then, of course, a suitable antidote should be given.

It is impossible for me to give here a list of the various poisons and the antidotes required for them; moreover, if the poisoning takes place in the country, where no chemist is readily accessible, it would be difficult to get a suitable antidote in time. On the whole, I think the subject may be left here, reliance being placed upon the measures which I have suggested.

EXTERNAL INJURIES.

It may be said that there are two forms of accidental injuries those which merely consist in external cuts or abrasions, or injury to the feathers or to the comb (such as occur through fighting), and the second class is internal injuries—that is to say, injuries which affect an internal organ or a limb, such as the wing or the leg.

With regard to external matters, such, for instance, as a good, big cut, which a fowl will sometimes get through catching itself on a thorn in passing through a hedge, or some similar accident, the most necessary thing is to keep it perfectly clean, and sew it up properly. A gaping wound should first of all be bathed with warm water containing a grain or two of permanganate of potash, and all particles of foreign matter of any kind carefully removed; then the wound should be stitched with a surgical needle and either catgut or silk, and a little carbolised vaseline smeared over the place.

If necessary, a bandage can be put round the bird, so as to prevent it from getting at the stitches, which, as soon as the place begins to heal, will become very irritating until a complete healing has been effected.

Should the stitches be burst or pulled out, and the wound be opened afresh the process will have to be gone over again, and special care should be taken to prevent this from happening more than once. The same principles apply to little matters, such as injuries to the comb and the wattles. Some birds are very pugilistic, and do a good deal of mischief before they are discovered, and it is no uncommon thing for one cock to tear off a portion of the wattles of his rival; the blood becomes scattered about on the feathers, and, if care is not taken, the vicious habit of feather-eating will be started by the hens pecking off the blood from the feathers of their lord and master. An injured comb should be carefully bathed and anointed with carbolised vaseline, and the bird should not be allowed at liberty again until all traces of the injury have disappeared.

INTERNAL INJURIES.

To be quite accurate, dislocated wings and broken legs are what generally occur among poultry. Another thing that happens sometimes is disjointing of the thigh, which is due to clumsy, careless people, who take hold of a fowl by one leg—a cruel and reprehensible practice, and one likely at any time to cause a dislocation of the thigh bone. With regard to dislocation of the wing-joint or dislocation of the thigh, a very careful examination must be made first of all, and then, if possible, the owner should refer to some standard book, (every poultry-keeper ought to have in his house one of the standard works on poultry), study the picture given of the anatomy of a fowl, so that he can see how the joints fit together. Let him then get the dislocated joint back into its proper socket, when this has been done, bandage the bird's body with an ordinary two-inch surgical bandage in such a way that the limb cannot possibly be moved, and let it be kept like that for several days, until it has had an opportunity of healing itself.

The other, and more troublesome, accident is a broken leg, and I have known that to happen through the poultry-keeper accidentally putting his foot upon the leg of a fowl when he has been surrounded by birds at feeding-time. A breakage or fracture is much worse than a dislocation, particularly if it is a compound fracture, as it nearly always is in such a case. If the bird be of comparatively little value, it is really better to put it out of its pain and misery by breaking its neck. But if it is desirable to save it, then a splint will have to be made, and the fractured edges of the bone made to fit together as evenly as possible. The limb having been fitted together, and the splint, which should be made of soft wood, having been applied to it, can be bandaged up, and the bird laid, with both its legs tied, upon some soft straw, and be kept there for forty-eight hours, when probably the process of rejoining will have started well, and one leg can be released, a bandage being put round the wings to prevent the bird from fluttering and hurting itself in some other way.

CHAPTER IX.—MISCELLANEOUS POULTRY TROUBLES.

Rheumatic Troubles—Cramp and Leg Weakness—Gapes—Causes of Sudden Death.

We have now arrived at the final chapter relating to the medical and surgical treatment of our feathered friends; and all that remains is for me to fill up certain gaps that have been left of necessity in what has gone before. I propose, therefore, in the first place, to deal with certain complaints which are not by any means clearly understood, and which are divisible really into two groups; and the first of these two groups I shall describe as

RHEUMATIC TROUBLES

Rheumatism has to be carefully distinguished from cramp, although, as a matter of fact, cramp and rheumatism are one and the same, the terms being interchangeable. What obtains, however, amongst poultry-keepers is that rheumatism is a term applied to full-grown birds, whilst cramp is the term applied to chickens. I shall have something to say about cramp presently, but for the moment will deal only with rheumatism. Rheumatism is closely allied to gout, and when a bird has been suffering from rheumatism brought about by being kept on damp land, or under conditions that induce rheumatic trouble, certain parts of its body become centres of that trouble, and then deposits begin to form which are distinctly what we call gouty. These swellings are always at the joints, and they are due to the attraction of the impurities of the blood to the rheumatic centres.

There is no cure for gout in poultry, any more than there is a cure for it in the human family, and the only advice that can be given is that it be foreseen and prevented. Gout and rheumatism would never occur if poultry were kept under proper conditions, except, indeed, amongst aged birds, which no farmer or poultry-keeper ought to have in his possession, because poultry do not pay when they are more than three years old, except in the case of exhibition specimens and the like, whose life is worth preserving for the sake of the prizes they will win.

Poultry that are affected with rheumatism are most likely those which have not had much exercise, but have been kept in a more or less idle and overfed condition and possibly in a damp place. Little or nothing can be done for them, and the only advice I can give in this direction is that any birds showing signs of anything like cramp should be treated with some simple liniment, and should have a dose of medicine occasionally, of sulphate of soda, Epsom salts, or something of that sort.

CRAMP AND LEG WEAKNESS.

I have said cramp only affects young birds. It is the cause of great loss amongst young chickens and ducklings especially, and it needs to be carefully distinguished from the other complaint, known as leg weakness. Cramp is rheumatic in its character. Leg weakness is due, not to rheumatic trouble, but to hereditary weakness and want of bone substance—a common trouble with chickens, especially those that are not properly fed. A chicken requires a considerable amount of bone-forming food. If it is fed on rice, for example, which contains nothing of the kind, it will become heavy in the body and weak in the legs, and when it gets a few weeks old, it will develop signs of what may at first be supposed to be cramp, but what in reality is merely weakness, due to want of bone-forming substance.

It is quite a simple matter to determine which of the troubles a chicken is really suffering from. If it has been kept in a damp place, and if its toes are turned in and clasped together, it is quite certain that the bird has cramp. If, on the other hand, it simply squats down, and seems unable to lift itself on to its legs, then the trouble is leg weakness only.

The way to deal with a case of cramp is to use a stimulating liniment. Embrocation or camphorated oil or something of that sort will bring new circulation into play—for cramp is defective circulation. On the other hand, the way to deal with a case of leg weakness is to give the bird stimulants and to alter the system of feeding.

The best foods for young chickens are oatmeal and milk by way of soft food, dry coarse oatmeal or groats and small broken wheat by way of dry food, and to the oatmeal and milk should be added about 10 per cent. of fibrine meat or crushed bone. I should also like to emphasise the importance of giving all chickens—whether they be well and strong or whether they be delicate—from time to time, in their drinking water, a small quantity of chemical food which contains lime and phosphates, for these are of considerable benefit in helping to build up the frame of the bird as it grows. In rearing chickens, what a man wants to do is to give them a good frame to carry abundance of meat later on, and a good frame can only be given by the aid of a little assistance, such as this chemical food will furnish.

GAPES.

No work on poultry diseases would be complete without reference to this trouble, which is the cause of a vast deal of mortality amongst young chickens, turkeys, and pheasants. It ought really to be included amongst parasitic diseases, because it arises from the presence of worms in the windpipe. Scientists are not by any means agreed as to how these worms get there. But the fact remains that they are to be found in the windpipe of chickens, and they are fatal unless speedily dislodged. The name itself describes the symptoms; the chickens open their mouths and gape and stretch their necks in the effort to breathe, for the worms, being lodged in the windpipe, actually prevent the chicken from breathing, and ultimately cause death by suffocation.

There is a disposition of chickens to gape when they have bronchial trouble, but this is readily distinguishable by anyone who is at all practical in such matters, because where a chicken is constantly gaping, it is quite an easy matter to take a long, soft feather, and gently insert it into the windpipe and twist it round, when if gape-worms be present, one or more will immediately be dislodged and come away. And here we get the real and effective method of treating the gapes. A feather dipped in turpentine should be used as described, and that is the only method that I know of which will effectually dislodge these worms. The other methods are more or less unsatisfactory. One plan, is to half-suffocate a bird in smoke or sulphurous fumes, and various plans have been tried to make the chicken sneeze and bring out the gape-worms in that way. However it may be, the chicken will try to sneeze of its own accord, without any forcing, and it is when a chicken cannot sneeze out its unwelcome guests that it becomes necessary to take steps to dislodge them in the manner I have described.

Apart from the cure of gapes, it is most necessary that steps should be taken to prevent its appearance at all. It is curious that this plague comes on year after year in the same locality. Some localities favour its presence, whilst in others it never appears at all. The explanation of this probably is that the particular localities are, for some reason or other, favourable to the development of the parasite. It is, therefore, very important that, when once gapes has made its appearance on a particular piece of land, that that land should not be used again for chicken-rearing until it is quite certain that it has been thoroughly cleared and disinfected in such a manner as to make it impossible for any of the worms or their ova to remain. Pheasant rearers have had experience of this, and they know how necessary it is to have fresh ground year by year for their young pheasants in such districts.

The usual plan adopted is to thoroughly lime the ground upon which it has made its appearance, and let that land lie fallow, or, at least, let grass grow upon it, for two years. All coops and runs in which chickens are kept, which have been affected by gapes, should be sprinkled with carbolic or some other disinfectant, with a view to getting rid of any traces of the parasites which may have been coughed out by affected birds.

CAUSES OF SUDDEN DEATH.

One frequently hears of poultry dying quite suddenly and their owners seem to think this a very unusual occurrence. As a matter of fact, there is just as much reason why poultry should die suddenly as there is that human beings should be taken off in that unexpected manner. There are really two causes, and two causes only, of sudden death amongst poultry ; one is syncope, or heart failure, and the other apoplexy, or brain paralysis. Syncope is likely to cause the death of a bird which is over-fat, especially if the fat has got round the heart. Many poultry have heart troubles of precisely the same character as human beings, and it is not in the least surprising that here and there one should suddenly drop off.

When a bird dies suddenly—or I will say, when a bird is taken suddenly ill, and, apparently, is going to die, and shows signs of having some sudden seizure, it is quite easy to determine whether it is a heart attack or a brain attack. It it is a heart attack, the chances are that the bird will die instantly, or, if not instantly, that it will be in a state of utter collapse, but not necessarily of unconsciousness. On the other hand, if apoplexy, which is brought about by the rupture of one of the capillaries or vessels near the brain, and the exudation of a small quantity of blood, which paralyses the nervous system, the bird will not die, but will probably lie for a considerable time in a state of unconsciousness, with its head twisted on one side. It may lie for two or three hours, or it may lie for two or three days, and in the latter case it probably will gradually recover, because, in cases of apoplexy, if the extravasated blood be reabsorbed into the system, the paralytic symptoms will disappear, and the bird will rally and recover. This is the difference between paralysis and syncope. As I have said, in the latter case the bird will almost certainly die suddenly or speedily, and in the former will either die in the course of a few hours, or gradually recover; nothing can be done—absolutely nothing—except keep the patient perfectly quiet. The best cure in either case, if one may put it in that way, will be to cut the bird's throat and bleed it straight away; and then, if its internal organs are healthy, it will be quite fit for the table.

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